GOVERNMENT OF TAMILNADU

SCIENCE

VIII STANDARD

Untouchability
Inhuman - Crime

Department of School Education

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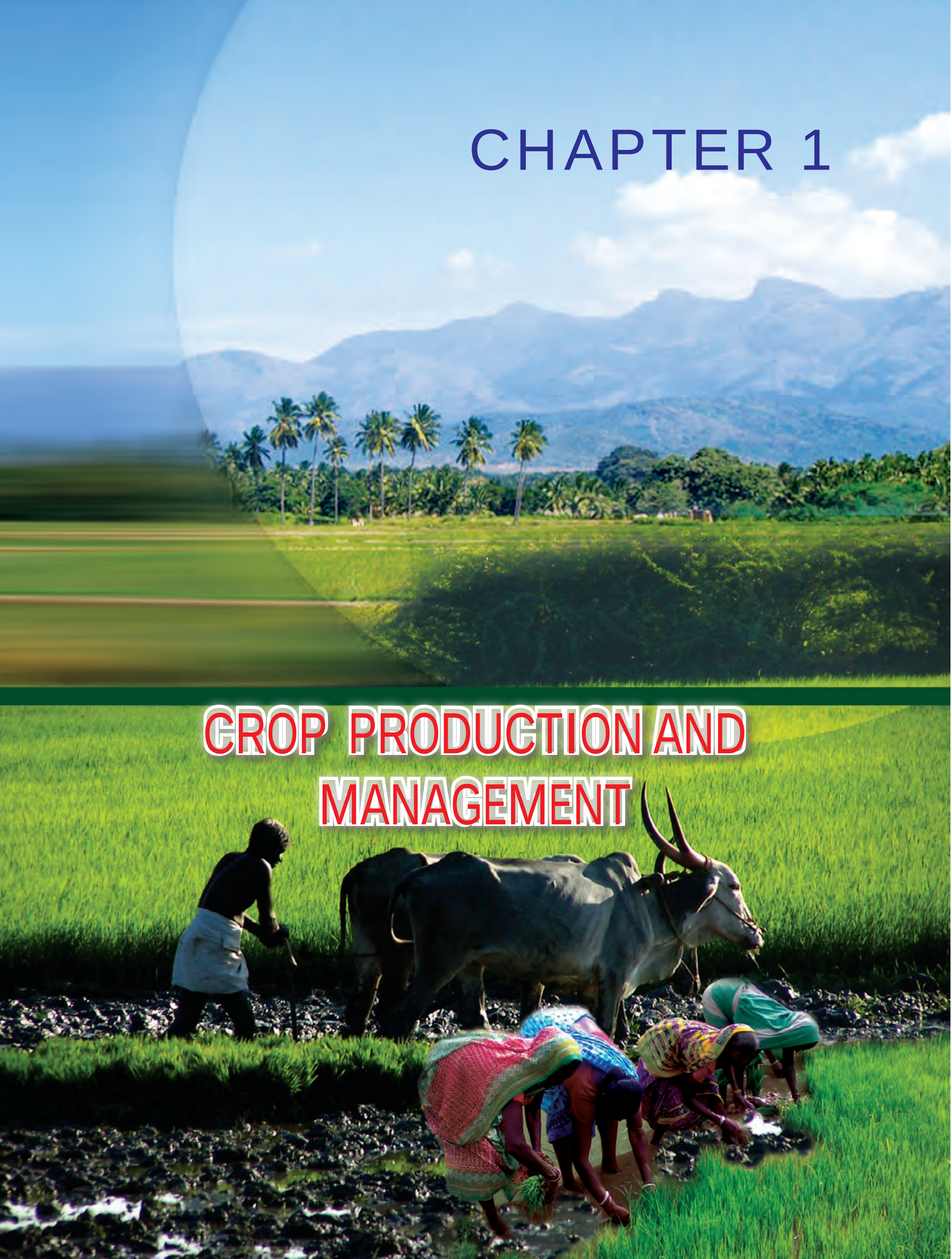
CHAPTER 1

CROP PRODUCTION AND MANAGEMENT



1. CROP PRODUCTION AND MANAGEMENT

India is an agricultural country. We all totally depend on agriculture for our basic needs, Food, clothing and shelter. Food is essential for our survival, it provides energy and materials required for the growth and maintenance of our body. Indian population had grown by 21.34% between 1991 and 2001. It is expected to exceed by 20% more in 2050. How do you think food can be provided to such a large number of people? In order to provide sufficient food for a larger population, a regular production, proper management, storage and application of recent technology are to be implemented in agriculture.

MORE TO KNOW

- Current Population of India in 2010 is around 1,192,196,919 (1.19 billion) people.
- It is growing faster than its ability to produce rice and wheat.

1.1. AGRICULTURAL PRACTICES

With the increase in population , the demand for food has also gone up. The available land for agriculture has been decresing. Therefore improved, agricultural practices have to be introduced.

BIOLOGY

All the activities which are involved in the cultivation of crops from sowing to harvesting are known as agricultural practices.

Agriculture : Science that deals with the growth of plants and animals for human use is called agriculture.

1.2. BASIC PRACTICES OF CROP PRODUCTION

Production of crops involves several activities carried out by the farmers over a period of time. These activities are given below.

- Preparation of soil and sowing
- Adding manure and fertilizer
- Types of irrigation
- Protection from weeds
- Harvesting
- Storage and Marketing

1.3. PREPARATION OF SOIL AND SOWING

Before sowing the seeds, we have to prepare the soil. Preparation of soil is the first essential stage for cultivation of crops, in order to turn the soil and loosen it. It involves,

- Ploughing or tilling
- Levelling and
- Manuring

i) Ploughing: It is the process of loosening soil. Ploughing is important because it,

- Provides good aeration to roots in order to breathe
- Retain moisture for a long period
- Promote growth of useful micro-organisms to bring nutrient rich soil to the top
- Helps in the removal of undesirable plants (weeds)

Ploughing is done in two ways

- **Manual ploughing** is one of the old and traditional methods of agriculture. A farmer ploughs the field with a plough drawn by a pair of bulls.

Ploughing

- Now a days ploughing is done by **tractor** driven by the **cultivator.** The use of cultivator saves labour and time.

Tractor and cultivator

The other ploughing tools are spade, shovel, hoe and pick-axe.

ii) Levelling: The ploughed field may have big pieces of soil crumbs, so, it is necessary to break these crumbs with the leveller. It also ensures uniform irrigation.

iii) Manuring: Sometimes manure is added before tilling. It helps in proper mixing of manure with soil.

Sowing: It is the most important step of crop production. The process of putting seeds into the soil is called sowing. Before sowing, the land must be watered. Seeds used for sowing should be of good quality, healthy and free from infection. Sowing is done by two methods.

Broadcasting: It is the traditional method of sowing where the seeds are sown manually by scattering them in the moist soil.

Manual sowing.

Seed Drill: It is a method of sowing the seeds through the funnel or using two or three pipes having sharp ends.

Seed drill helps in uniform distribution of seeds, covering the seed after sowing and preventing the seeds from being damaged by birds.

Sowing by seed drill.

Adding manure and fertilizers

All the plants get their nutrients from the soil. Repeated cultivation of crops make the soil deficient in minerals. So farmers add manure and fertilizers to the soil to ensure that the crops get proper nutrients.

The substances which are added to the soil in the form of nutrients for the healthy growth of plants are called manure or fertilizers.

1.4. IRRIGATION

Plants need water for germination, drawing nutrients and preparing their food by photosynthesis.

The process of supplying water to crops in the field at different intervals is called irrigation. It varies from crop to crop, season to season and soil to soil.

Some of the sources of irrigation are well, tube wells, ponds, lakes, rivers, dams and canals.

Methods of irrigation

i) Traditional Method

In our country traditional systems of irrigation like,

- pulley system (moat)
- chain pump and
- lever system (rahat)

have been used for centuries to lift water from water reservoirs and supply it to the field for irrigation. These methods are cheaper but not much efficient.

ii) Modern Methods

Furrow irrigation ↑ | Sprinkler irrigation ↑

Modern methods of irrigation

↓ basin irrigation | ↓ drip irrigation

Furrow irrigation: In this method water is allowed to enter the field through channels of furrows made between two rows of crop. e.g., sugar cane, banana etc,.

Furrow irrigation

Basin irrigation: In this method the field is just filled with water.
e.g., Paddy Field.

Basin irrigation

Sprinkler irrigation: This irrigation is used where the soil cannot retain water for a long time. Here the water is sprinkled by sprinklers. e.g., Lawn

Sprinkler irrigation

Drip irrigation: In this irrigation the water falls drop by drop direct at the position of the roots, so it is called drip irrigation. It is the best method to save water. It helps to irrigate grapes, banana, brinjal, etc.,

Drip irrigation

Care must be taken not to water the field excessively. Excess water on the field may cause a condition called water logging which may harm the crops.

ACTIVITY 1.1

Select a small place in your garden. Use a spade or a shovel, plough the soil and sow seeds with the help of a funnel and sprinkle water.

MORE TO KNOW

- The Kara kum canal in Turkmanisthan is the longest irrigation canal in the world. It is over 1300 km long.
- PAP – Parambikulam Aliyar Project ranks first in India in the top 10 list of the World for its massive storage capacity.
- Indira Gandhi Canal - It is one of the biggest cannal project in India. Starts from Harike Barrage at Sultanpore.

1.5. PROTECTION FROM WEEDS (UNWANTED PLANTS)

Weeds are undesirable plants growing naturally along with the crop. Removal of these weeds is called weeding. Weeding should be done then and there.

The weeds must be removed because,

They compete with crops for water, nutrients, space and light therefore affect their growth.

Some weeds become poisonous.

The common types of weeds are

- Grass
- Amaranthus
- Chenopodium

Methods of weeding

i) **Manual weeding**: Weeds may be manually removed by hand by uprooting them or by using some tools like hand fork, khurpa and harrow.

Tools used for weeding

ii) **Chemical Control:** The chemical substances which destroy the weeds but do not harm the crop are called weedicides. eg. Dalapon, metachlor, 2-4- Dichlorophenoxy-acetic acid.

Excess use of chemical weedicides cause water and land pollution. Traces of these poisonous chemicals may remain in crops themselves. Therefore it is very important to use them with extreme caution.

BIOLOGY

Weedicide sprayer

Does it affect the person who sprays it?.
Yes certainly. But we can prevent by using the mask.

MORE TO KNOW

Bio-weedicides are the mechanism of using micro organism such as fungi and bacteria to destroy weeds.

1.6. HARVESTING

Once the crop gets matured, it has to be gathered. The process of cutting and gathering a matured crop is known as harvesting.

All over the world harvest season is celebrated with excitement. Pongal (Tamilnadu), Bihu (Assam), Holi (Punjab), Onam (Kerala), etc., are the harvest festivals celebrated in India.

What is your experience in harvesting? Harvesting of paddy in our country is either done manually by sickle or a machine called harvester.

In small farms crops are usually cut down using a hand held tool called a sickle. In big farms a large vehicle called harvester combine is used.

Manual Harvesting

Harvester combine

Grains are seperated from the stalks by the process of threshing. This is carried out by beating the cut stalks against hard floor or a machine called mechanical thresher.

Manual threshing

The chaff (pieces of straw and husk after threshing) is separated from the whole grain by winnowing.

Manual winnowing

Silo

MORE TO KNOW

Neem leaves, salt, turmeric and castor oil also prevents pests and micro organism.

MORE TO KNOW

Green Revolution: The massive step taken to augment food production by adopting modern agricultural practices in India.

1.7. STORAGE

Grains are kept safe from moisture, insects and micro-organisms. If they are not kept in a proper manner they will get spoiled and cannot be consumed.

Farmers store grains in jute bags and metallic-bins. In a large scale the grains are stored in godowns silos, (very tall cement tanks) and granaries.

Fresh fruits and vegetables have much moisture content. And thus they get spoilt soon. Therefore they are stored in cold storage.

1.8. MARKETING

Increase in agricultural production alone will not bring about prosperity for farmers. It is important that agricultural product fetches a remunerative price. Warehousing and marketing facilities are essential to ensure this strategy.

“Uzhavar Sandhai”

BIOLOGY

Government has taken more steps to assist marketing of agricultural product and to promote the status of small farmers. Tamilnadu Government has established "Uzhavar Sandhai" to satisfy the need of consumer and the small scale village farmers.

Regulated markets eliminate unhealthy marketing practices and exploitation of the products by middleman.

The government provides loan at very low rate of interest to the farmers for cultivation.

MORE TO KNOW

State warehousing corporations provide storage facilities for agricultural product, fertilizers etc.,

Thanjavur is said to be the Rice Bowl of Tamilnadu.

Agmark: Agmark grading and standardization is a central sector scheme to check the quality and standard for agricultural products. The grades given are Grade 1, 2, 3, 4 or Special, Good, Fair and Ordinary.

1.9. CROP ROTATION

What will happen if the same crop is grown again and again on the same land? By repeated planting of the same plant a part of minerals gets depleted in the soil. It then leads to very poor yield. One way of improving the crop yield is by crop rotation. In this method different crops are grown alternately.

The practice of growing a cereal crop and the pulse crop alternately in the same field in successive season is called as crop rotation.

ACTIVITY 1.2

Take a trowel and carefully dig up a pea plant or any leguminous weed from the garden. Wash off the mud and observe the bead like structures on the roots called nodules.

Leguminous plants have root nodules associated with symbiotic bacteria which fix atmospheric nitrogen.

For example wheat and paddy (plants need nitrogen to make protein, they can't use nitrogen directly from the air) absorb more nitrogen from soil. This lost nitrogen can be replaced naturally by leguminous plants which has symbiotic bacteria in their root nodules.eg. pea, soya, bean are cultivated after wheat or paddy.

1.10. BIOTECHNOLOGY IN AGRICULTURE

Biotechnology is the field of applied biology that involves the use of living organisms and bio-processes in engineering, technology, medicine and other field requiring bioproducts.

Biotechnology has also revolutionised research activities in the area of agriculture.

There are seven different techniques that are used in plant improvement.

1. Selection
2. Hybridisation
3. Polyploid breeding
4. Mutation breeding
5. Protoplast fusion
6. Tissue culture and,
7. Genetic engineering

Genetic engineering

Genetic engineering is a part of biotechnology. It offers new hope to the farmers who are struggling hard with plant pests and diseases.

The aim of agricultural biotechnology is to give transgenic plants carrying desirable traits like

- Disease / Insect / Herbicide resistant.
- Increased photosynthetic efficiency.
- Nitrogen fixing ability.
- Increased size of storage roots, seeds, fruits and vegetables.
- Oil seeds (soya) rich in PUFA (poly unsaturated fatty acid) recommended for heart patients.
- Potatoes with vaccines, improves starch and vitamin A is produced.
- Genetically modified (GM) seeds, biofertilizers, biofuels are also produced.

1.11. BIOTECHNOLOGY IN FOOD PROCESSING

Food processing industry is the oldest and largest industry using biotechnological processes. Biotechnology in food processing is used to improve existing processes such as

- Production of additives and
- Processing aids.

Improving of micro organisms in order to improve process, control, yield, safety and quality of the processed products.

Application of biotechnology in processing of food

- Gene modification and transfer.
- Development of recombinant vaccines vitamins and proteins.
- Improving the quality, safety and consistency of fermented foods.
- Improving of microorganisms in order to improve process, control and yield of the processed products.
- Improving the processing properties eg., Development of the "flavr Savr, tomato" variety. Genetically modified to reduce its ripening rate.

Bioethics of genetic engineering

Besides many benifits, the ethical, social and legal implications of these potent gene technologies have led to considerable concern about the possibility of accidentlly producing new pathogens responsible, for fatal diseases or developing **'genetic monsters'.**

MORE TO KNOW

Biotechnology helps in promoting greater fruit and vegetable consumption for healthy nutrition.

ACTIVITY 1.3

Can we list the processed foods used in your daily life?

1. Soft drinks.
2. Chips
3. ____________
4. ____________
5. ____________

EVALUATION

1. Choose the correct answer:

a) Sowing is done in large scale by ______ (broad casting / seed drill)

b) We can prevent pest at home in natural way by using (Thulsi leaves / Neem leaves)

c) Pick the odd one out. (hand fork, harrow, sickle, hoe)

d) Government has established ________ to satisfy consumers and farmers in marketing. (Uzhavar Sandhai / Co-operative bank / Private shops)

c) Choose the fermented food. (wine / fresh juice / milk)

2. Arrange the following steps of preparation of soil in correct order.

a) Sowing

b) Levelling

c) Ploughing

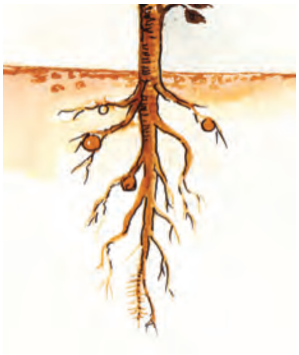
3. Match the following

a) Furrow irrigation	—	to irrigate grapes, banana etc.,
b) Basin irrigation	—	used where soil can't retain water.
c) Sprinkler irrigation	—	between two rows of crop.
d) Drip irrigation	—	paddy field.

4. Name the types of irrigation related to the following figures.

A)--------------------- B)-------------------- C)-------------------- D)--------------------

5. Label the diagram of the taproot system and write it's significance.



6. Classify the following chemicals based on the uses given below.

(Phosphorus, 2, 4 – D, Pottassium, Dalapon, Nitrate, metachlor)

Fertilizers	Weedicides
1.	1.
2.	2.
3.	3.

7 a)

- Mani is repeatedly cultivating same paddy crop in his field and getting poor yield.
- Nathan likes to go for changing the crops every season and getting good yield.
- From the above statements find out and justify the best method of agricultural practice.

7 b) Classify the following items based on the storage methods.

(Apple, Wheat, Potato, Rice, Grape, Sorghum)

Dry storage	Cold storage

8 a) Complete the circles based on applications of Genetic Engineering.

Herbicide Resistant

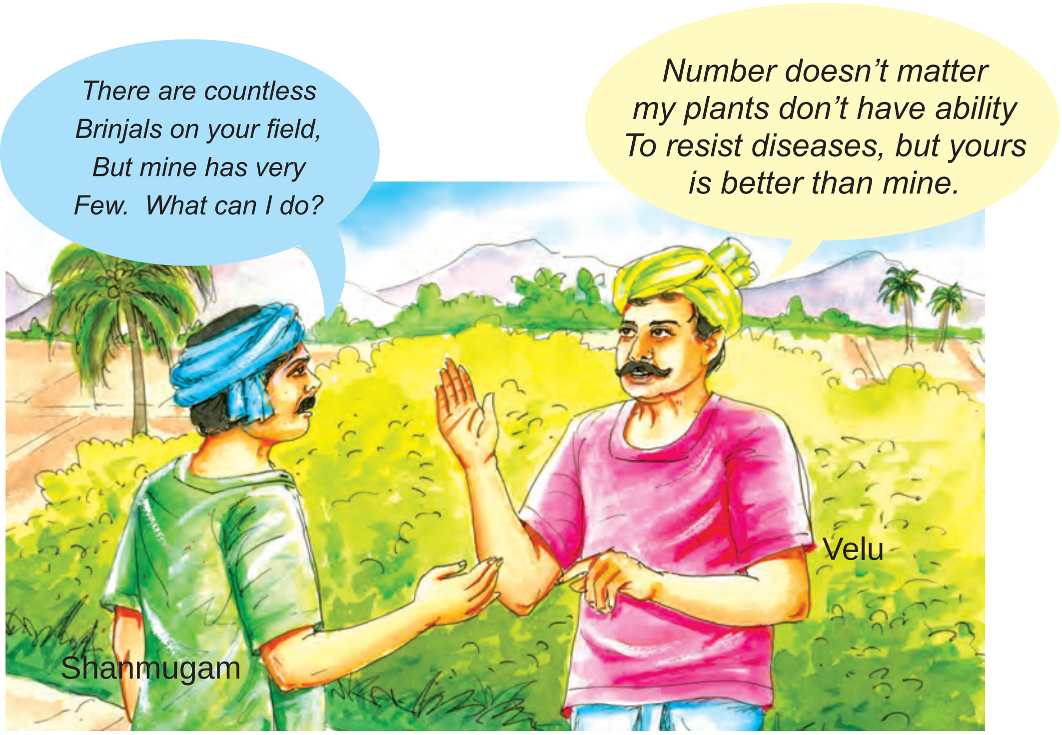
Genetic Engineering

?

?

?

8 b)



From the above statements, suggest techniques to overcome the problems of Shanmugam and Velu.

9. List some more common crop plants

Common crop plants.			
S.No	**Crop group**	**Crops**	
1.	Cereals	Wheat,----------------------------	
2.	Pulses	peas,-------------------------------	
3.	Vegetables	potato, ---------------------------	
4.	Fruits	apple,-----------------------------	
5.	Oil seeds	coconut,---------------------------	
6.	Sugar yielding crops	sugarcane------------------------	

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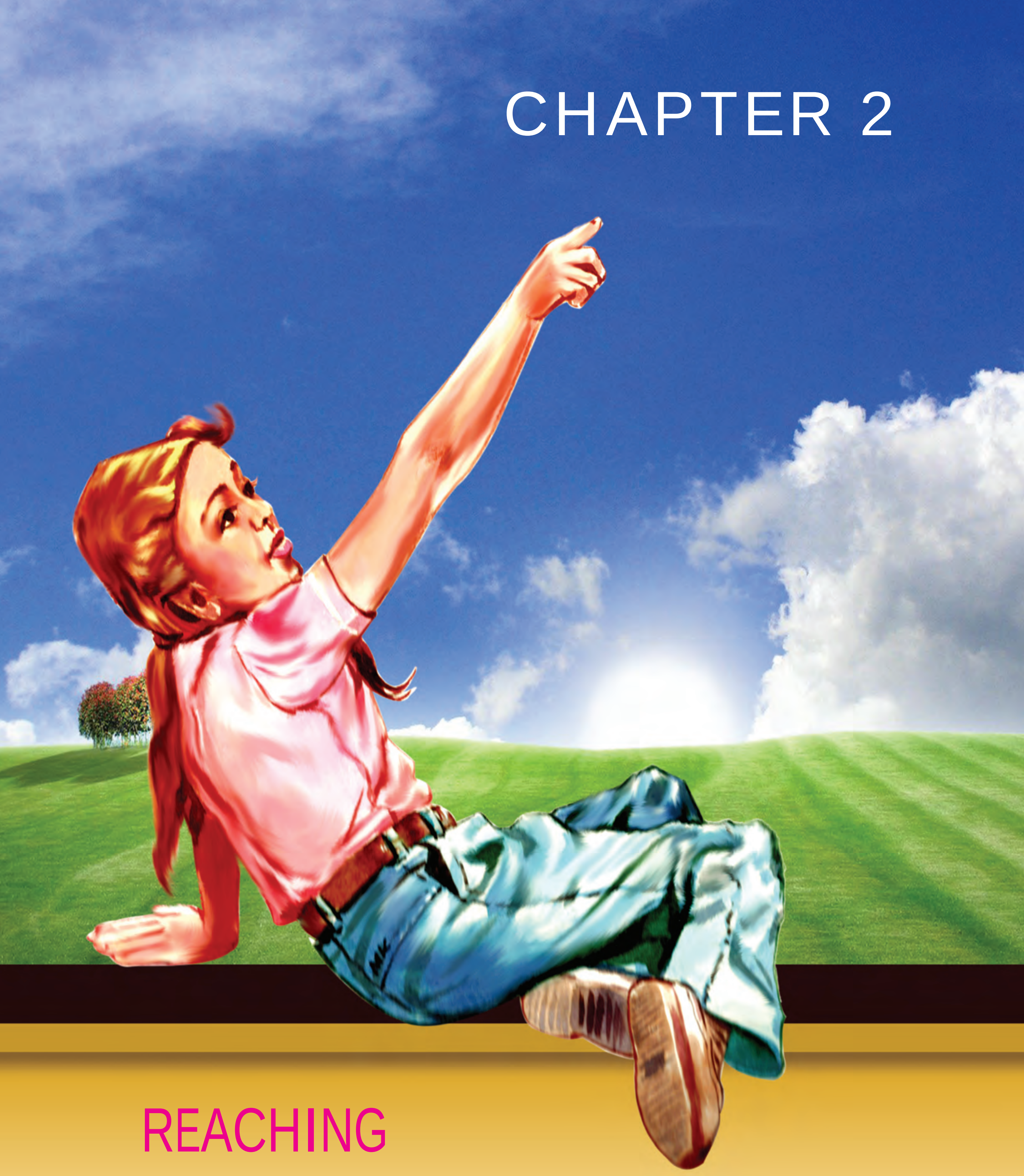
CHAPTER 2



REACHING THE AGE OF ADOLESCENCE

2. REACHING THE AGE OF ADOLESCENCE

"It is the fact that,
flesh, blood and bones
are hidden under
a cover of skin in your body.
You also have thoughts
and feelings,
that are not visible.
But they have an important role
in making you
the special person that you are."

2.1. ADOLESCENCE AND PUBERTY

The word 'Adolescence' is derived from the Latin word 'adolescere' which means 'to grow'. The period of transition from childhood to adulthood is called adolescence. The World Health Organization (WHO) defines **adolescence as the period of life between 11 and 19 years of age**. Since adolescent period covers the "teens period", adolescents are usually called teenagers. It is a period when lots of changes take place in the body and mind. Hormonal changes result in unusual swings in emotions.

Adolescents shoot up in height and gain weight. The growth spurt begins two years earlier for girls than for boys. But it lasts longer for boys.

The rapidly changing body proportions and the new sensations attributed to sexual development confuse and cause anxiety to the adolescents. This chapter aims at helping adolescents understand the physical, cognitive, social and emotional changes during adolescence.

Puberty

Puberty is the period in life when the body's reproductive system gets ready to work. Generally, boys attain puberty at the age of 14 to 15 years, while girls reach puberty at a comparatively lower age of 11 to 12 years.

As you grow up, people will be quick to notice that you are getting taller but they may not see that you also changing shape. Let us see this in detail.

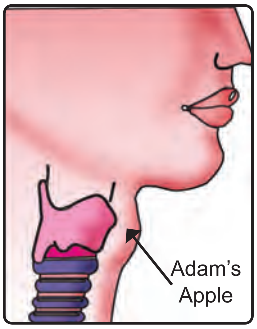
Changes at Puberty

The following changes take place in the body of boys and girls at Puberty

1. Increase in Height: There is a sudden increase in the height of both boys and girls during Puberty. The rate of growth in height varies from person to person. Some may grow rapidly at the start of Puberty and then slow down, while as others may grow gradually. The height of an individual depends upon the genes which are inherited from parents.

2. Change in Body Shape: The changes occurring in adolescent boys and girls are different. In girls hips become broader and the pelvic region widens. In boys, shoulders broaden and the body muscles grow more than that of the girls.

3. Change in Voice: At Puberty the voice box or the larynx begins to grow. The larynx in boys is larger than that in girls. The voice box in boys can be seen as the Adam's Apple, in their throat In boys, the voice becomes deep and harsh, where as girls have high pitched voice.



4. Increased activity of Sweat and Sebaceous glands: The secretion of sweat and sebaceous glands (Oil glands) increases during Puberty. This causes acne and pimples on the face of boys and girls at this time.

Development of Sex Organs

The Reproductive Organs in boys and girls become fully functional at Puberty. In boys, the male sex organs like the testes and penis develop completely. The testes start producing sperms.

In girls, the ovary enlarges and eggs begin to mature. Ovaries start releasing matured eggs.

These sex organs produce sex hormones, which play an important role in the process of reproduction and in the development of secondary sexual characteristics.

Apart from these changes that are taking place in emotional, mental and intellectual areas, they may experience various moods such as being happy, sad, angry, excited or irritated.

2.2. SECONDARY SEXUAL CHARACTERS

Certain characters helps to distinguish the male from the female. They are called secondary sexual characters. Some of the secondary sexual characters that develop in girls and boys are as follows:

Boys

1. Facial hairs such as beard and moustaches develop.
2. Hair develops under the armpit, under chest and in the pubic regions.
3. Voice becomes deeper.
4. Muscles develop, and shoulder becomes broad.
5. Increase in weight.

Girls

1. Development and enlargement of breasts.
2. Hair develops under the armpit and in the pubic regions.
3. Hips broaden and pelvic region widens
4. Initiation of menstrual cycle.
5. Deposition of fat around hips,
6. These changes which occur at adolescence are controlled by hormones.

2.3. DUCTLESS GLANDS

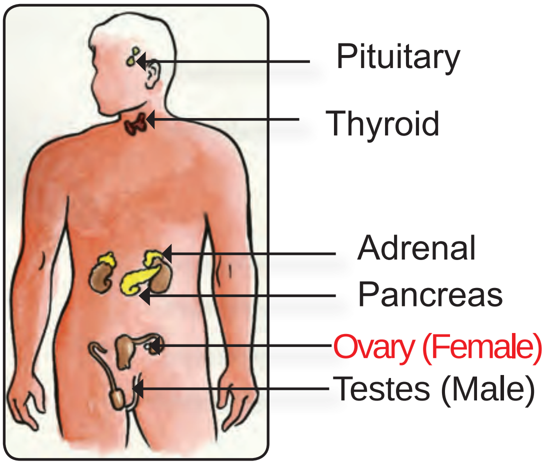
Introduction

The word gland means having some secretions. There are two types of glands.

1. Exocrine gland – gland with duct
2. Endocrine gland – gland without duct.

The exocrine gland secretes enzymes which are important for digestion. The ductless or endocrine glands secretes hormones. They are special chemical substances that make wonders in our body.

The following are the important Endocrine Glands (Ductless) present in our body.



1. Pituitary
2. Thyroid
3. Pancreas
4. Adrenal
5. Testes (Male) Ovaries (Female)

Pimple:
A small papule or pustule. Pimples are sebaceous glands that are infected by bacteria, become inflamed and fill with pus.

BIOLOGY

The secretions of the ductless glands (hormones) are carried away by the blood stream.

Let us see the functions of these glands.

1. Pituitary gland: It is located just below the brain. It is called as the master gland because it secretes number of hormones which control the functioning of all other glands. Your growth depends on the secretion of the pituitary gland. It secretes growth hormone. A person having less growth hormone remains very short (Dwarfism) ; on the other hand, a person having much growth hormone becomes very tall (Gigantism). In adults, excess secretion leads to a condition called **acromegaly.**

2. Thyroid gland: It is located in the throat region. It secretes a hormone called thyroxine. The function of thyroxine is to control the rate of **Metabolism,** growth and respiration.

The deficiency of thyroxine hormone in children is known as **cretinism**. It slows down growth and mental development. Sometimes the gland may enlarge causing a disease called **Goitre**.

3. Pancreas: Pancreas is located just below the stomach in the body. Pancreas is both exocrine and endocrine. The endocrine part is called **Islets of langerhans**. It has alpha and beta cells, which secretes glucagon and insulin. Both control sugar metabolism in the body.

Deficiency of insulin in the body causes a disease known as **diabetes mellitus**.

4. Adrenal gland: These are also known as supra renal glands, as they are located just on the top of the kidneys. It secretes adrenalin hormone. This hormone is produced during stress or emergency situations. It regulates heart beat, breathing rate, blood pressure etc.

5. Testes and ovaries: Testes and ovaries secrete sex hormones. Testes produce testosterone and ovaries produce oestrogen hormones. We have already learnt that these hormones are responsible for male and female secondary sexual characters.

2.4. ROLE OF HORMONES IN REPRODUCTION

Most hormones are at work from the moment you are born. Sex hormones are different because they start to work later on. They gradually prepare the body for reproduction.

The sex hormones are responsible for the fundamental change in growth and development and stimulate the developments of secondary sexual characters.

The testes and the ovaries are the reproductive Organs; both are stimulated by the pituitary hormone during Puberty.

IN BOYS

In male, the testes produces the male sex hormone testosterone. This hormone helps in the development and maintenance of the primary and secondary sexual characters and functions of sperms.

IN GIRLS

In female, the ovaries secrete estrogen and progesterone responsible for the primary and secondary sexual characters.

Apart from testes and ovaries the Adrenal Cortex also secretes steroid hormones in both the sexes. These hormones are responsible for adolescent growth spurt.

2.5. REPRODUCTIVE PHASE OF LIFE IN HUMANS

What is Reproductive Phase? How long does it last in males and females?

The phase during an individual's life during which there is production of gamets is called Reproductive Phase. In females it is normally between 13 to 50 years, and in males, it is from the age of 13 to life long. The reproductive age may vary from person to person.

The following are the various reproductive phases in the life of a female.

1. Ovulation: Release of an ovum from the ovary - usually one egg is released every month.

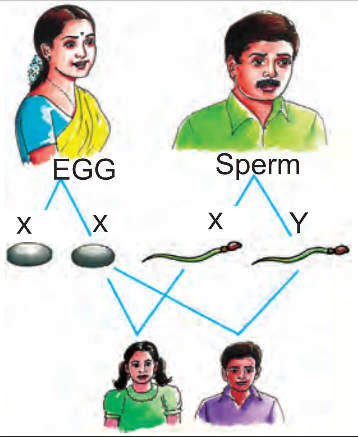
2. Menstruation or the period: This is the outward sign of the routine cycle of egg production and hormone change in a women's body. It takes about 3 – 5 days.

3. Pregnancy: When the egg gets fertilized by the sperm, the zygote is implanted in the uterus for further development this results in pregnancy.

4. Menopause: The menopause marks the end of the reproductive phase of a women's life, the chief outward sign is the cessation (stop) of the monthly flow of menstrual blood. The usual age is around 50.

2.6. SEX DETERMINATION

Do you know which is responsible for the determination of sex? What makes the fertilized egg to develop either into a boy or a girl?



If you want to know about that, you should know about the chromosomes. Chromosomes are thread like structures present in the nucleus of the cell. All the cells contain 23 pairs of chromosomes, The last pair of chromosome is different in males and females. The last pair determines the sex, so it is called as **sex chromosome**.

Sex chromosomes are of two types, These are named as X. and Y chromosomes. Usually a woman has two 'X' chromosomes (XX) and male has one 'X' and one Y chromosome (XY), in their cells. During gamete (reproductive cell) formation the number of chromosomes is reduced into half. (46 chromosomes are reduced into 23).

When a sperm containing 'X' chromosome fertilizes the egg, the zygote will have two 'X' (XX) chromosomes. The zygote will develop into a female child.

Similarly, when a sperm containing 'Y' chromosome fertilizes the egg,

the fertilized egg will have one 'X' chromosome and one 'Y' chromosome (XY), and it will develop into a male child.

Now you know that the sex chromosomes of the father determine the sex of a child. The belief that the mother is responsible for the sex of her baby is completely wrong.

2.7. REPRODUCTIVE HEALTH

During adolescence growing children need special attention towards diet, exercise and personal hygiene. The personal hygiene includes female and male reproductive health.

The following are some of the measures that girls and boys need to take to maintain personal hygiene.

- Take bath atleast once a day, paying special attention to underarms, groins and genitals.
- Change the underwear daily. The underclothes should be made of cotton.

Menstrual hygiens for girls:

Menstruation in females is as natural as our regular physiological activities like breathing, drinking, eating, urinating, and defecation etc., It is a cyclical process that is present in all the mammalian females.

- So It is a natural phenomena, that is neither to be worried nor to be ashamed. Sanitary napkins (pads) or a pad made of clean soft cloth which can absorb moisture should be used for absorbing menstrual flow.
- Sanitary napkins or cloth should be changed frequently depending upon the menstrual flow. If a cloth is being used repeatedly, it should be cleaned with soap and hot water and dried in sunlight for reuse.
- Wash with soap and water before using a fresh napkin.

2.7.1. Nutritional Needs

The adolescents need more calories and other nutrients due to spurt in growth and increase in physical activity.

The nutritional deficiencies during this period not only retard the physical growth, but also impair the intellectual development and delays sexual maturation. The diet of adolescents should meet the demands of physical and intellectual growth, provide adequate reserves for illness / pregnancy and prevent adult onset of diseases related to nutrition e.g., Hypotension and osteoporosis. (Bones become brittle)

A very good amount of proteins and carbohydrate is necessary during this growth period. Apart from that, adolescents need to keep in mind the following dietary consideration:

Minerals: Since there is an increase in skeletal mass and blood volume, the body needs calcium, phosphorous and iron.

Calcium: Calcium intake needs to be increased to prevent osteoporosis in later life. It is present in milk and milk products.

Iodine: It helps to prevent thyroid gland related diseases.

Iron: Lack of iron in the diet results in anemia. To make up for the loss, have a diet rich in iron. In boys, iron deficiency occurs due to muscle spurt if it is not adequately supplemented. In girls, iron deficiency occurs due to menstruation in addition to the spurt in muscular growth if it is not adequately supplemented.

Green leafy vegetables, jaggery, whole pulses are rich sources of iron.

During adolescent period, take hygienic balanced diet.

2.7.2. Personal Hygiene

Personal hygiene is a clear indicator of man's personality. Personal hygiene should start from the hair tip and ends down at the toes.

Remember and practise the following 10 tips for your personal hygiene

1. Shower or bath daily.
2. Always wash your hands before and after meals.
3. Keep fingernails clean, and avoid wearing nail polishes or jewellery.

GERM FARM

4. Wash your teeth and mouth before and after each meal.
5. Avoid touching your face, nose, or mouth, while preparing food.
6. Avoid coughing or sneezing around food.
7. If you want to taste the food, use a clean spoon.
8. Change your clothes, especially undergarments, everyday.

9. Do not defecate in open field. Use clean toilets for defecation.

10. If you are not well, do no take self medication. Go to a doctor.

2.7.3. Prevention of and protection from sexual and other abuses

Preventing childhood sexual abuse

Taking steps to prevent childhood sexual abuse is an ongoing parental responsibility. In 80% of cases the abuser is someone the child knows a trusted or loved adult or older child who may use threats, bribery or tricks to take advantage of the child's innocence.

There are three stages in the Prevention of sexual abuse. They are.

1. Primary Prevention
2. Secondary Prevention
3. Tertiary Prevention

Primary Prevention: It involves preventing the abuse from happening in the first place. Avoid being alone in company of suspected person. Don't wear provocative dresses. Do not let allow anyone to hug, pet or kiss you. Take care of the way you sit. When you are going to school by auto, bus or by train keep distance from the other sex.

Secondary Prevention: It includes early detection and reporting of perpetrators for the purpose of stopping the perpetrators and minimizing the negative effect on the child.

Tertiary prevention: It focuses on the treatment of abused children and adults who have developed signs and symptoms of distress.

Warning signs of sexual abuse: Children who have been sexually abused often show the following signs:

A sudden dramatic change in behaviour or personality.

- Recurring nightmares.
- Regression to early behaviour patterns such as bed wetting.
- Withdrawal from friends and family members.
- Imitating adult sexual behaviour.
- Hostile, aggressive behaviour.

Substance abuse: To pre-teens and teens, alcohol tobacco and drugs may seem like a quick way to move into the adult world. These substances cause serious problems, and their use leads to **addiction.** Alcohol is the most abused substance among teenagers. Consumption of alcohol leads to frequent memory loss and hepatitis (liver damage).

Drug: (Fr. drogue – a dry herb) is a chemical which is taken for some illness and is withdrawn when the desired effect is achieved.

Illegal Drugs: Illegal drugs are drugs used for recreation, but it is against the law to take them, because it is extremely dangerous. The side effects

are serious and the drugs are highly addictive, ruining peoples lives. The effects of the drug and addict's life style can lead to a very unpleasant death. These drugs slowly reduce the functioning of nervous system and heart functions. Opium, Heroine, Marijuana and Cocaine are some of the illegal drugs.

These drugs slowly change the behaviour of the users:

some of the behavioural changes are as follows:

1. Rejection of old friends and the acquiring of new ones.
2. Sudden lack of interest in hobbies on extracurricular activities.
3. Staying away from home after school.
4. Drop in grades and disinterest in school work.
5. Less concern with Personal appearance.
6. Mood swings or extreme irritability.
7. So, please say a big 'No' to drugs if you come across any temptation in your life.

Prevention of drug abuse

1. Children should avoid the company of drug addicts.
2. Advertisements of drugs on public media should be banned.
3. Doctor's advice and prescriptions should be strictly followed.

2.7.4. Smoking hazards

Cigarettes have been deemed one of the greatest health hazards of the 20th century and are now widely regarded as the chief preventable cause of death. Tobacco products such as cigarettes, cigars, smokeless tobacco (like snuff and chewing tobacco) are more dangerous. When a cigarette is burned, it is broken down into its chemical elements from which lethal chemical compounds are created.

The period between puffs allows time for nicotine, ammonia, acetone, formaldehyde, hydrogen cyanide and some 4000 other chemical constituents to become irritants, poisons, mutagens and more than 40 types of carcinogens.

Some of the evil effects of smoking are

- Raising bad cholesterol (Low Density Lipid), decreasing good cholesterol (High Density Lipid)
- Blood vessels are constricted, damages the lining of the arteries making the blood more sticky. This increases the risk of blood clots and dramatically raises the risk of a heart attack or stroke.

- 80% of cancerous deaths are linked to it.
- Smoking aggravates asthma, bronchitis, pneumonia and emphysema.
- Also the causative agent for peptic ulcers, cataracts.
- Cigarettes increases the risk of infertility in both men and women.
- Children of smokers are also far more susceptible to asthma and ear infections.

Healthy food

- Dear children please avoid junk food. Take healthy foods like bean sprouts. Let us know about bean sprouts.

2.7.5. SPROUTING

Why should we sprout?

Sprouts are a living, enzyme-rich food, natural and low in calories. Their vitamin A content will usually double, various B group vitamins will be 5 - 10 times higher, and vitamin C will increase by a similar order. Their protein content becomes easily digestible, and rich new nutrients such as enzymes are created. They contain significant amounts of bio-available calcium, iron and zinc.

When a dormant seed sprouts, its starch is converted into simple sugars, and long chain proteins are split into smaller, easily digestible molecules. **Sprouted beans and seeds are like a predigested food, one of the most enzyme-rich and nutritious foods known.**

What you can sprout

Most seeds sprout easily, as do many legumes. Nuts are more difficult to sprout. It is recommended that soaking all the nuts, legumes and grains that we consume, which then become a wonderful, highly nutritious and essential component of a living food diet.

Best sprouting results in sunflower seeds and mung beans. This may be a reflection of the local conditions and suppliers.

Mung beans make an excellent sprout, used widely in cooking. However, they primarily use the sprouts and not the beans, and the sprouts are often stir-fried.

Soya and kidney bean sprouts are toxic and may be avoided. Sprouted lentils, black eyed beans, partridge peas, peanuts cause poor digestion and gas.

Bean sprouts are easy and cheap to grow at home.

1. Pick over the beans to remove any damages ones.
2. Soak them in a clean water overnight or for about 12 hours.
3. Drain, rinse and place them in a wide mouthed bottle. Allowing room for the sprouts to grow.
4. Cover the jar with cotton cloth.
5. Keep it in the dark area of your house as sunlight makes them taste bitter.

As soon as the bean germinate, all the starches, oil and other nutrients packed into it – to nourish the tiny plant begin to turn into vitamins. Enzymes and other forms of proteins mineral and sugars. The Vitamin C content of the bean increases, when it starts sprouting. Rinse the bean sprouts two to four times a day. They will be pale green fresh and ready for eating in two to six days.

2.7.6 Cancer and its prevention

Normally body cells grow and reproduce in an orderly way. In contrast cancerous cells multiply rapidly. This is due to damaged genetic material of the cell. This stage is known as initiation. It can be influenced by external factors like radiation, viral infections and certain chemicals. These cancerous cells create lots of problem in our metabolism and invade to the other areas through blood streams, where they cause secondary tumours. This stage is called **metastasis**.

What causes cancer?

Cancer is ultimately the result of cells that uncontrollably grow and do not die. Normal cells in the body follow an orderly path of growth, division, and death. Programmed cell death is called apoptosis, and when this process breaks down, cancer begins to form. Unlike regular cells, cancer cells do not experience programmatic death and instead continue to grow and divide. This leads to a mass of abnormal cells that grows out of control.

What are the symptoms of cancer?

Cancer symptoms are quite varied and depend on where the cancer is located, where it has spread, and how big the tumour is. Some cancers can be felt or seen through the skin - a lump on the breast or testicle can be an indicator of cancer in those locations. Skin cancer (melanoma) is often noted by a change in a wart or mole on the skin. Some oral cancers present white patches inside the mouth or white spots on the tongue.

Other cancers have symptoms that are less physically apparent. Some brain tumours tend to present symptoms early in the disease as they affect important cognitive functions. Pancreas cancers are usually too small to cause symptoms until they cause pain by pushing against nearby nerves or interfere with liver function to cause a yellowing of the skin and eyes called jaundice. Symptoms also can be created as a tumour grows and pushes against organs and blood vessels. For example, colon cancers lead to symptoms such as constipation, diarrhoea, and changes in stool size. Bladder or prostate cancers cause changes in bladder function such as more frequent or infrequent urination.

How is cancer classified?

There are five broad groups that are used to classify cancer.

1. Carcinomas are characterized by cells that cover internal and external parts of the body such as lung, breast, and colon cancer.
2. Sarcomas are characterized by cells that are located in bone, cartilage, fat, connective tissue, muscle, and other supportive tissues.
3. Lymphomas are cancers that begin in the lymph nodes and immune system tissues.

4. Leukaemia are cancers that begin in the bone marrow and often accumulate in the bloodstream.
5. Adenomas are cancers that arise in the thyroid, the pituitary gland, the adrenal gland, and other glandular tissues.

Prevention

The following are some of the ways to prevent diseases like heart attack, cancer, diabetes, hypertension Smoking cause lung cancer. It is related to mouth, throat, oesophagus, pharynx, larynx and liver. Smoking should be avoided.

High intake of fruits and vegetables are protective against many forms of diseases like heart attack, cancer, diabetes and hypertension. A vegetarian diet is typically high in fibre, low in saturated fat compared to meat eaters.

High intake of beta carotene, vitamin C and other vitamin containing food should be taken. Apart from citrus variety of fruits, bean sprouts is also an excellent source of vitamin C.

Try to reduce your weight, if you are obese.

Avoid pickles and salty foods.

Treatment involves surgery, chemotherapy radiotherapy and hormonal therapy.

EVALUATION

1. Adolescents sometimes experience various mood swings such as being happy, sad, angry, excited or irritated. What makes them behave so?
2. The deficiency of thyroxine hormone in children is cretinism. It slows down growth. Apart from this, write one more disorder.
3. Note the endocrine glands given in column A with their respective hormones in column B.

A	B
Pituitary	Oestrogen
Thyroid	Adrenalin
Pancreas	Growth hormone
Adrenal	Thyroxine
Ovary	Insulin

4. Give reasons for the following.

   i) Smoking increases the risk of blood clots.
   ii) Smoking aggravates asthma.
   iii) Bean sprout is good for health.
   iv) cancerous cells multiply rapidly

5. Pituitary, thyroid, adrenal, pancreas, testes and ovary. From the glands listed above one gland acts both exocrine and endocrine. Name it.

6. The human sperm consist of head, middle piece and tail. What purpose does the tail in a sperm serve?

7. Babu heard his mother and aunty talking about his cousin who is going to have a baby, they were discussing whether she would give birth to a boy or girl,

   a. Will it be possible to judge the sex of the child by them?
   b. What makes the fertilized egg develop either into a boy or a girl?

Project work

1. How many of your classmates are doing exercises regularly and who do not exercise regularly? Did you notice any difference in their fitness and health? Prepare a chart on their benefits of regular exercise and fix it in your classroom.

2. Collect information from newspapers, magazines and from the local health centre about the evil effects of cigarettes and alcohol. Prepare a chart and display it permanently in your classroom.

3. Prepare a colourful poster on the theme, 'Say No to Drugs'.

FURTHER REFERENCE

Books

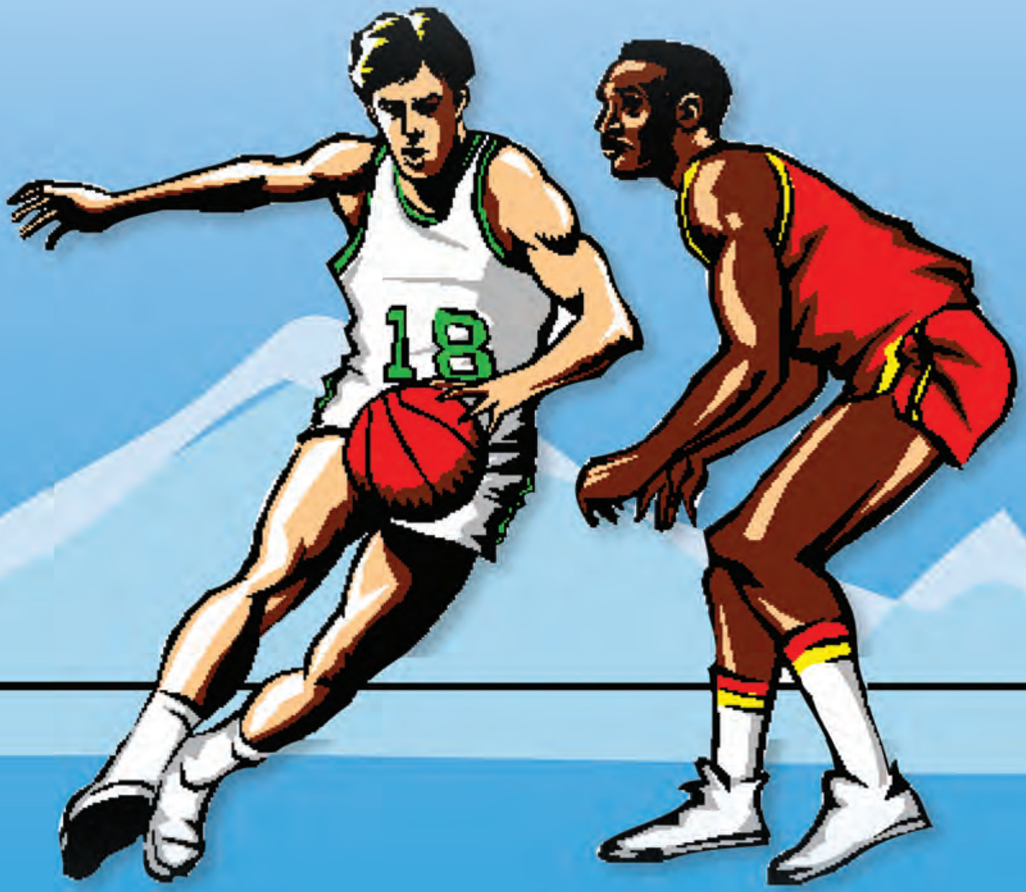
Biological science by Taylor, Green an Stout – Cambridge University Press

The complete family health book- Donna Shelly, Sharyn Ann Lenhart and Roslyn E. Epps - St.Martin's Press

Websites

http/en.wikipedia.org/wiki/smokinghazards

CHAPTER 3



BODY MOVEMENTS

3. BODY MOVEMENTS

3.1. HUMAN BODY AND ITS MOVEMENTS

Observe the pictures. What are the activities of human beings? How do they perform all these activities?

Human body perform all these activities with the help of the movements of the bones and muscles.

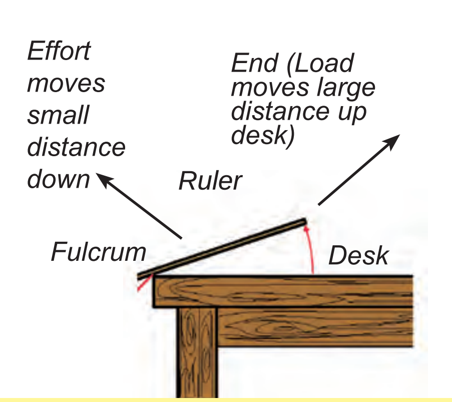
Human body is made up of very important frame work of bones which is known as skeletal system and it is associated with muscles.

How do muscles and bones work?

Most of the muscles help in the movement of various parts of the body or help it to stay upright. Muscles cannot push, they can only pull. Many of them work in pairs. They are attached to bones by tendons. Tendons are thick strands or sheets of connective tissues. A muscle tightens and becomes shortened while pulling the bone attached to it. When it relaxes the other muscle tightens and the bone moves back.

DEMONSTRATION

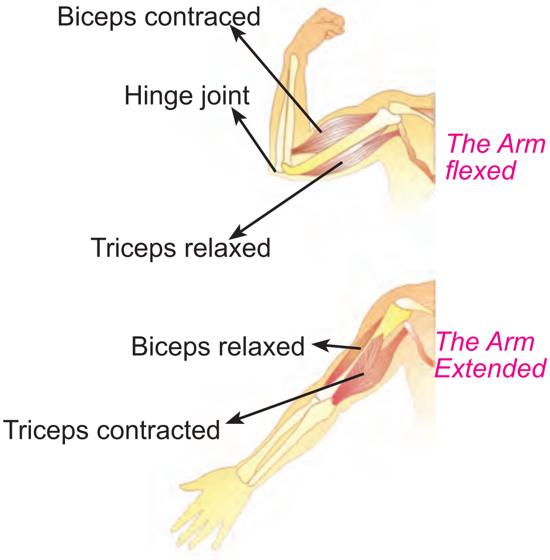
Demonstrate this yourself using a ruler. Place a ruler on your desk with one end at the edge of the desk as shown in the figure. Apply some pressure to the end of the ruler. The other end will lift through a considerable distance, although the end where pressure is applied will not move very much.



A mechanical example of a lever using a lever

Bones and muscles work like this in the body.

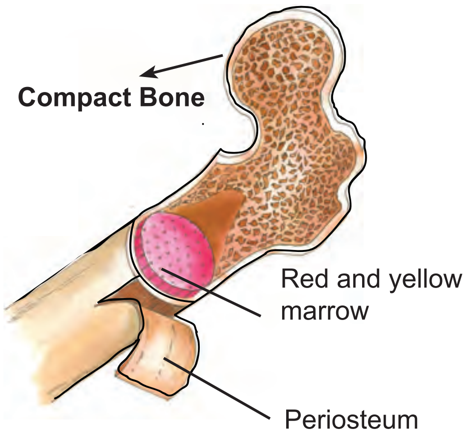
The figure of the movement of the elbow joint shows the two muscles which work antagonistically(in opposite Direction) to bend (flex) and straighten



(extend), the arm at the hinge joint of the elbow. The muscle lies above the upper arm, this is the muscle that can be seen and felt bulging if you flex your arm at the elbow. When you straighten (extend) the arm, the muscle at the back of the upper arm is relaxed.

Bone is a hard, greyish-white substance of which, two thirds is composed of inorganic matter or minerals like Calcium, Phosphate, Carbonate which make the bone more brittle. The remaining one-third is organic matter.

Bones are not solid. They have a strong outer layer of light weight compact bone which is spongy inside. In the centre, a soft marrow is present which makes new Red Blood Cells (RBC) for the blood. We have to protect and maintain the body's delicate vital organs like brain, lungs, heart, etc., and to help us move about. Almost all bones of the body may be classified into four main types on the basis of their shape. Bones have a strong covering like skin, this outer layer is called periosteum.



A section through thigy bone or femur

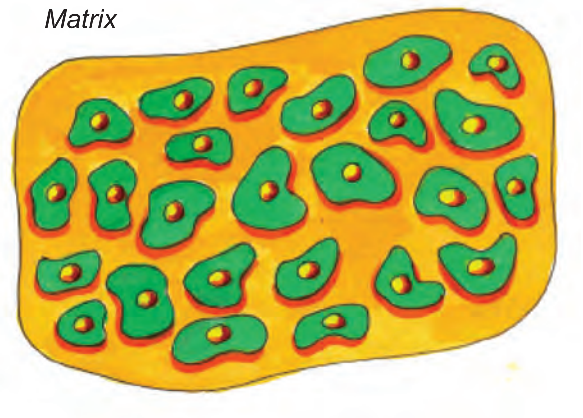
S.No	Shape	Example
1.	Long Bones	Bones of thighs, legs, toes, arm, forearm and fingers
2.	Short Bones	Wrist and ankle
3.	Flat Bones	Cranial bones, scapula clavicle and sternum clavicle
4.	Irregular Bones	Vertebrae coccys and certain skull facial bones

3.2. JOINTS AND TYPES OF JOINTS

Bones fit together at the joints and are held firmly by ligaments. Ligament is a form of connective tissue.

What is a Joint?

A joint is a point of contact between the bones and the cartilage and between bone, teeth. The structure of the joint reflects its function.



Structure of cartilage

ACTIVITY 3.1

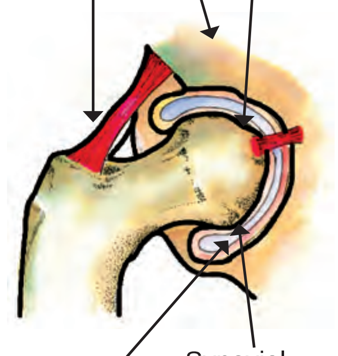
- Rotate your arms.
- Fold your hand up and then relax.
- Twist your wrist right and left.
- Turn your head to one side and then to the other side(left to right).
- Open your mouth wide and close.
- Name the joints and muscles involved in each activity.

Types of Joints

Some joints permit no movement, others permit slight movement, and still others afford considerable movement.

BIOLOGY

S. No	Name of the joint	Nature	Example
1.	Fibrous Joints	Bones are held together fibrous connective tissue with no synovial cavity. These joints include immovable sutures	Skull bone between calf bone and tibia
2.	Cartilaginous Joints	Bones are held together by cartilage with no synovial cavity	Ear lobe, tip of nose, sternum
3.	Synovial Joints	All synovial joints are freely movable in selected directions and contain synovial cavity, articular cartilage and a synovial membrane	Hip joint, shoulder joint, elbow, atlas and axis, tarsal bones



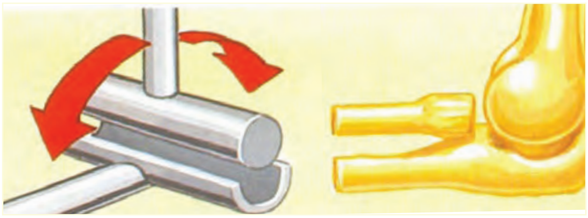
A typical synovial joint at the hip

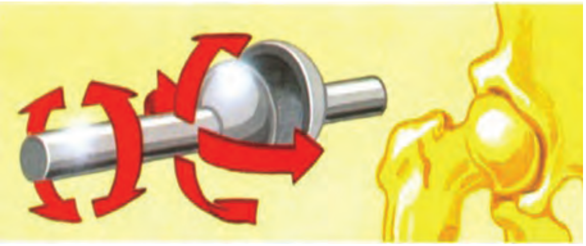
Some synovial joints.

Ball and socket joints

Example:- Hip joint and Shoulder Joint.

They consists of a ball like surface of one bone fitted into a cup like cavity of another bone.





Hinge Joint

Example:- Elbow, ankle, etc., It is one in which the convex surface of one bone fits into the concave surface of the other bone.

Gliding Joint

Example:- Tarsal bones, the sternum and clavicle. The articulating surface of bone in these joints are usually flat. Movement is not around an axis.

Pivot Joint

Example:- Atlas and Axis

Rotating of head from side to side. It is one in which a rounded, pointed, or conical surface of one bone articulates with in a ring formed partly by a ligament.

3.3. SKELETON

We studied that the Skeletal System is instrumental in performing movements such as walking, running, etc., We shall observe the divisions of the Skeletal System in this unit.

Can we count all the bones in the human skeleton?

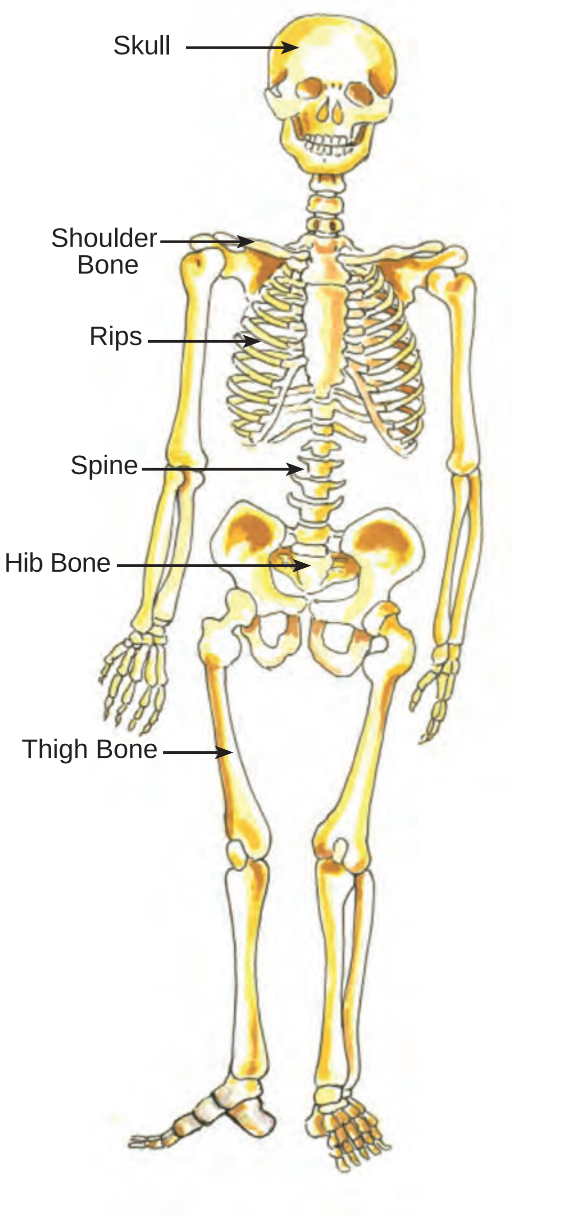
Yes, we can. The adult human skeleton consists of 206 bones. They are classified into axial skeleton and appendicular skeleton.

ACTIVITY 3.2

Collect some shells from a near by pond. Note the animals which have the: a). Shell in one piece, b) animals which have the shell in two pieces attached at one point, c) animals which have no shell.

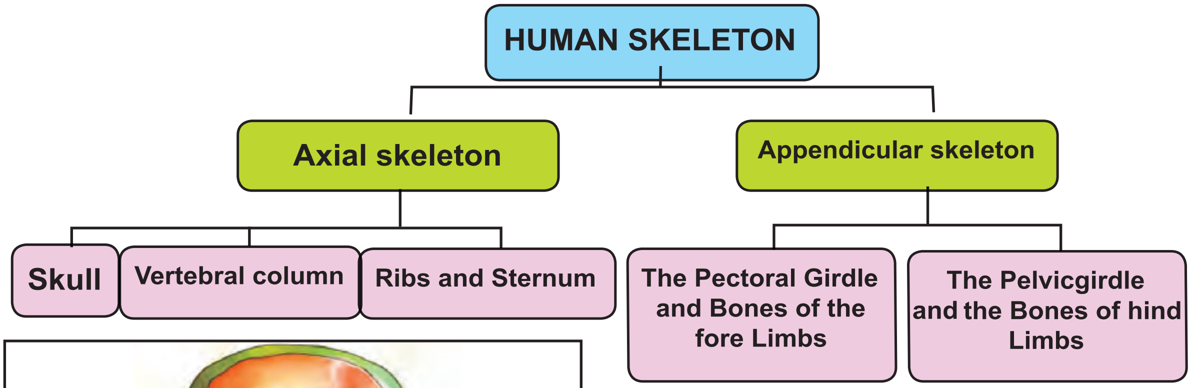
ACTIVITY 3.3

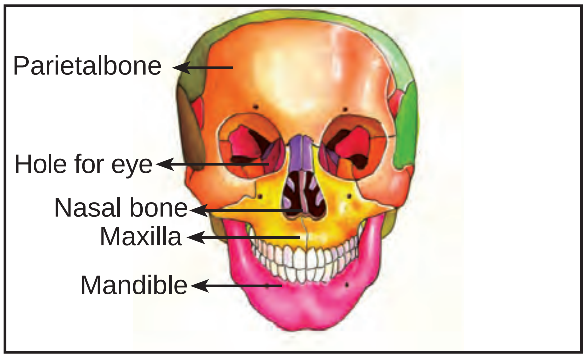
Observe the mounted adult human skeleton in the biological lab.



Human skeleton

BIOLOGY



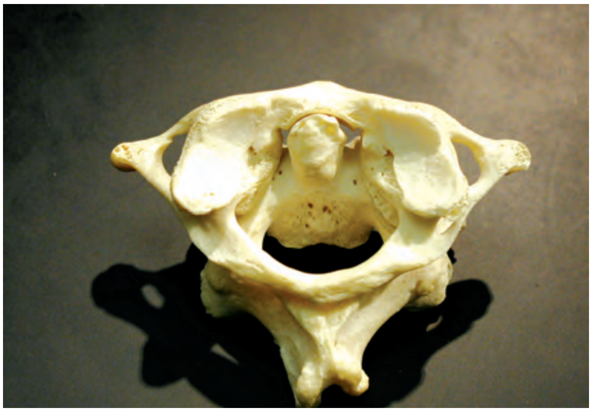


Human skull

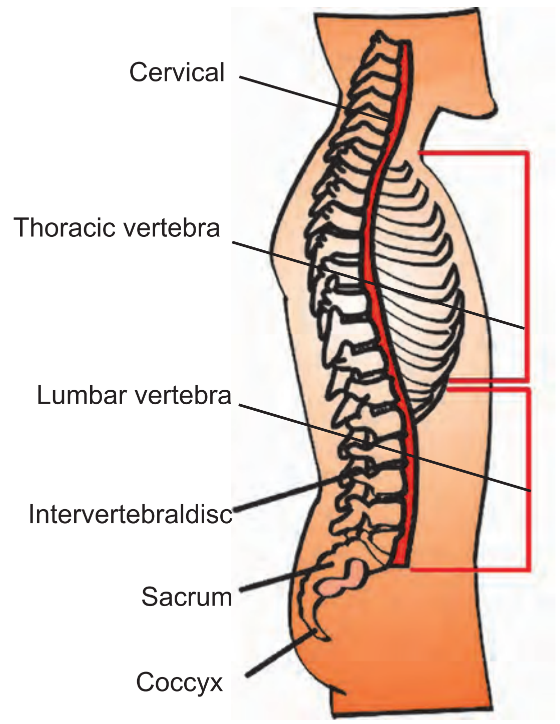
Axial skeleton

The vertebral column has a characteristic curve. It has five distinct regions. They are listed below.

- Cervical Region (neck region) consists of seven vertebrae
- Thoracic Region (chest region) consists of twelve vertebrae
- Lumbar Region (Abdominal region) consists of five vertebrae



Atlas and axis



Vertebral Column

- Sacral Region (Hip region) consists of five vertebrae
- Coccygeal Region(vestigial region) consists of four vertebrae. They are rudimentary.

Ribs and sternum (Ribcage)

Protect the vital organs like lungs, heart, etc., There are twelve pairs of ribs.

Ribs and sternum

The ribs at the sides, the sternum in the front and the backbones together form the "chest box"

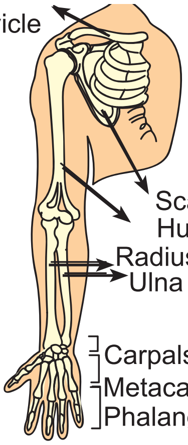
The first seven pairs of ribs are directly attached to the sternum and are called 'true ribs'.

The next three pairs of ribs which are not directly attached to the sternum are called 'false ribs'.

The last two pairs (11th and 12th) are short and not connected to the sternum they are called 'floating ribs'.

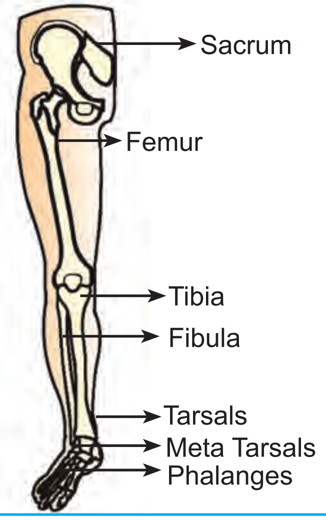
Appendicular skeleton

The appendicular skeleton includes the Pectoral and pelvic girdles and the bones of the limbs (arms and leg bones).



Right Pectoral gridle and upper arm

Regions of the Skeleton	No. of Bones
Axial	80
Appendicular	126
Total	206



Right Pelvic gridle and lower limp bones

Functions of the Skeletal System

Support: Provides frame work and supports the soft tissue.

Protection: Many vital internal organs like brain, heart, lungs are protected.

Movement facilitation: Serves as lever and helps to produce movement.

Storage of minerals: Stores minerals like calcium, phosphate and carbonate.

Production of blood cells: Bone marrow produces the RBC, WBC and blood platelets.

MORE TO KNOW

The largest and smallest bones in our body.

- The largest bone in the human body is the thigh bone or femer. In an average man, it is about 45cm long.
- The smallest bone is the Stapes, inside the ear.

MORE TO KNOW

Support and movement of some invertebrates

- Roundworms are fluid - filled with muscles directed longitudinally, permitting lashing movements only.
- Certain molluscs make use the hydrostatic property for making digging movements with the muscular foot.
- In molluscs, external shells are continuously secreted by the mantle and take several forms.

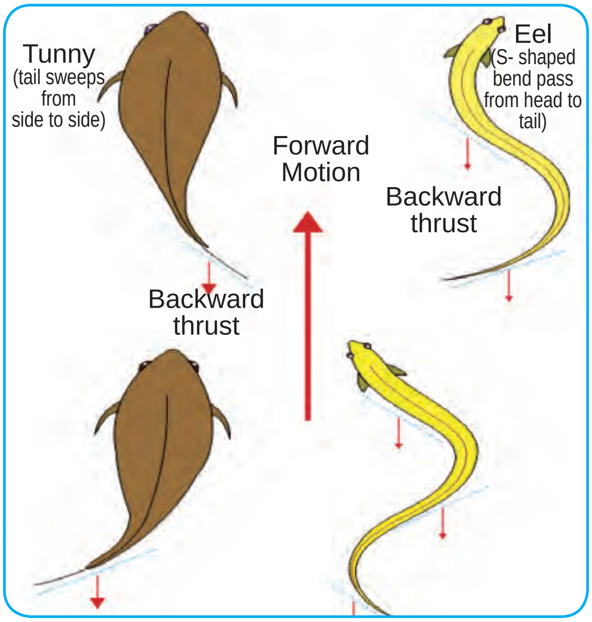
3.4. MOVEMENT OF ANIMALS

Animals move from one place to another in response to stimuli in search of food and shelter in order to mate and to escape from predators. These movements are caused by muscular action in response to stimuli. Various kinds of organs like cllia, flagella, appendages, fins, limbs, setae, muscular foot and wings are present in animal to perform these movements.

Fish

Fishes live only in water. Their stream-lined bodies are best suited for locomotion in water. Fins are locomotion organs. The fins are also adaptated for moving efficiently through the water. Most fish swim by waving their tails from side to side (eg. Tunny fish). Some fish , such as Plaice and flounders, are flat. When these fish swim, they move up and down.

Eels are fish with long bodies and moving with its whole body from side to side. Bony fish posses swim- bladders which are filled up with gas or air. They are hydrostatic in function. By moving

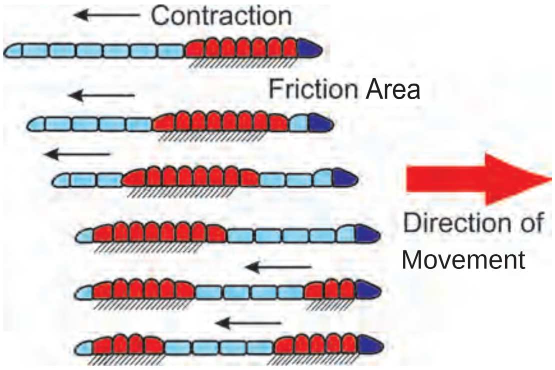


Swimming Movements

certain fins, fish can change direction. They can go up or down, from left to right, or from right to left.

Earthworms

Earthworms move with the help of body muscles (both circular and longitudinal muscles) and setae. The setae can be projected or withdrawn with the help of protractor and retractor muscles in setae sacs. These setae provide a grip for the animal to move on the surface of the soil. The earth worm moves at the rate of 25cm per minute. The nervous system coordinates the activities of circular and longitudinal muscles. So the contraction of any layer brings about relaxation of the other muscle layers.The coelomic fluid serves as hydraulic skeleton because a decrease in its pressure results in the relaxation of muscles.



Movement of the earthworms

The earthworms can move on a smooth and hard surface like glass by using mucus for adhesion as the setae cannot anchor the substratum.

ACTIVITY 3.4

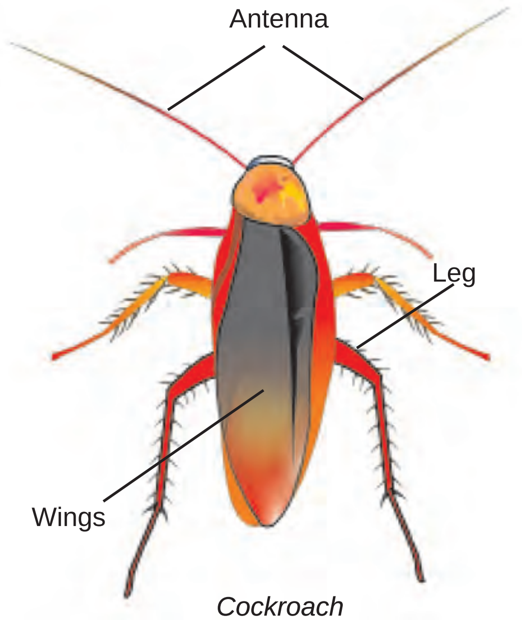
Take two eartworms. Place one on a glass slide and the other one on a rough surface. Observe the movements. Which one moves fast? Find out reasons.

Cockroach

Cockroach is a swift runner as well as a flier.

The six legs are helpful in walking or running. When the cockroach is at rest, the coxae of the legs lie back against the body and the first legs are directed forward. The hind legs are stretched

out posterior and the middle legs take whatever position is convenient. During locomotion, the first pair of legs is directed forward which determine the movement of the insect during walking or running. Thorax bears two pairs of wings. Fore wings are elytra and forms a protective covering. Hind wing is membranous and is used for flight.



Cockroach

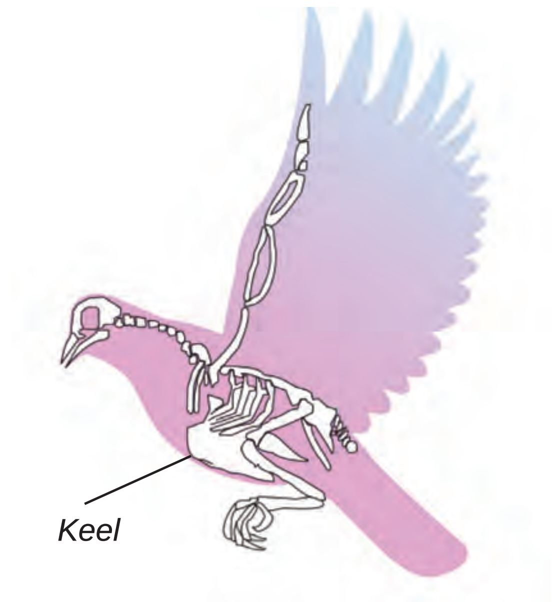
Snake

Movement of the snake

This S-shape movement also known as undulatory locomotion is used by many snakes on land and in water. Starting at the neck, a snake contracts its muscles thrusting its body from side to side, creating a series of curves. In water this motion easily propels a snake forward because each contraction pushes against the water. On land, a snake usually finds resistance points on the surface such as rocks, branches or dents and uses its scales to push on the points all at once, thrusting the snake forward.

Birds

Birds are best suited for an aerial mode of life. The body is stream-lined and thus offers the least amount of resistance for movement in the air. The wings are a modified forelimbs. The reduced body weight facilitates easy flight. This is brought about by the hollow (pneumatic) bones and air sacs in the cavity of the bone. The powerful flight muscles anchored to a bony flap on its chest. The flap is called keel. The powerful pectoral muscles serves to pull the wings downwards and upwards.



The following pictures show how most of the birds fly.

Down Stroke

On the down stroke of the wing the feathers overlap so, that no air can get through, and the bird can push itself along through the air

Down Stroke

Up Stroke

On the upstroke the feathers twist open. So air passes through, allowing the bird to lift its wings easily.

Up Stroke

Landing

It lands by spreading out its wings and tail as a brake.

Landing

EVALUATION

1. Choose the word that is different from the others in the following and suggest reason.

a. Clavicle b. Skull c. Femur d. ball and jocket

2. Rotating of head from Side to Side is a function of a Joint. Name the Joint

3. Fill in the blanks.

a) A tendon attaches a _______ to a _________.

b) Earthworms move with the help of body muscles and _______.

c) Bones have a strong covering like skin, this outer layer is ________.

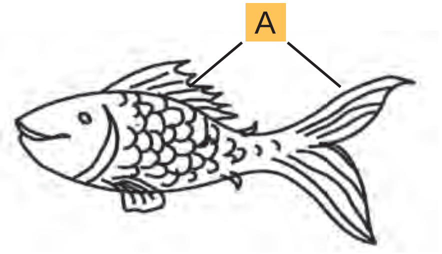
4. Which one of the following is not matched correctly?

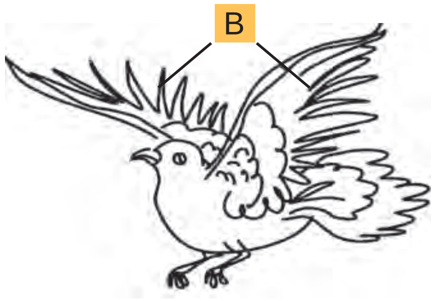
A	B
1. Hip joint	Ball and socket
2. Hinge joint	Atlas and Axis
3. Gliding joint	Tarsal bones

5. The skeletal system has many other functions besides helping in movement. Do you know what they are?

- Formation of blood cells
- ___________________
- ___________________

6. Identify A and B and state their functions.





7. Copy the diagram and label the following in it.

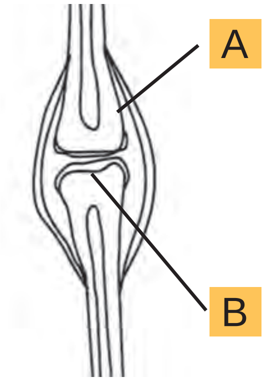
a) Ball

b) Periosteum

c) Yellow marrow

d) Compact bone

8. Copy the diagram of human joint . Label the parts A and B and write their funcions.



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BIOLOGY

CHAPTER 4

PICTORIAL FEATURE OF PLANT KINGDOM

4. PICTORIAL FEATURE OF PLANT KINGDOM

4.1. FUNGI

Fungi do not have chlorophyll and cannot prepare their own food.

All of us would have noticed the sudden growth of mushrooms soon after the rain in humus soil. They belong to the kingdom of fungi.

Fungi is a third kingdom of Whittaker which include moulds, mushrooms, toadstools, puff balls and bracket fungi.

Mould

Mushroom

Bracket fungi

Puff balls

BIOLOGY

Features of fungi

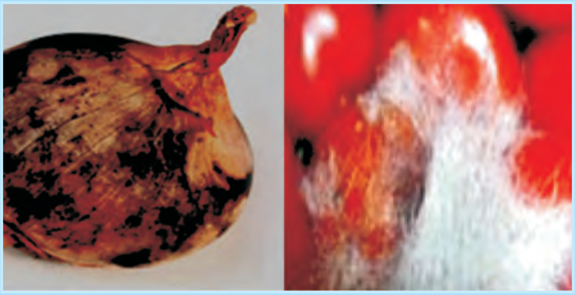
1. They may be unicellular (e.g., Yeast) or multicellular (Rhizopus, Agaricus. Aspergillus)
2. They are non green organisms as they lack chlorophyll.
3. Their body is made up of hyphae called mycelium and is covered by cell wall made up of chitin.
4. It reproduces by sexual or asexual reproduction.
5. Based on nutrition, fungi are classified into three types.
   - Parasites- Fungi living on other living organisms. e.g., Puccinia.
   - Saprophytes- Fungi living on dead and decaying matter. e.g., Agaricus, Rhizopus.
   - Symbionts- Fungi (living associated with algae (lichens) or on the roots of higher plants (Micorrhizae).

ACTIVITY 4.1

Let us list out few eatables affected by the growth of fungi, which you have observed.

1.............................2.........................

3.............................4.........................

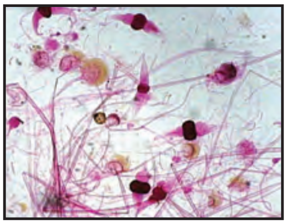
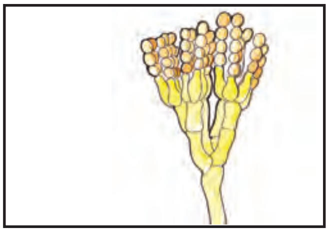


Fungal affected Onion and tomato

MORE TO KNOW

- There are about 1,00,000 different species of fungi that have been named.
- Lichens are bio indicators of environmental contamination.

Classification of Fungi

Zycomycota (Bread Mould)	Ascomycota (sac fungi)	Basidiomycota (Club fungi)	Deuteromycota (Penicillium)
			

We and fungi

1. Food

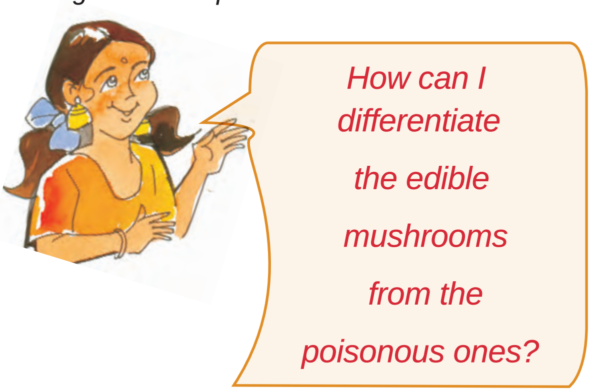
The mushrooms are rich in protein and minerals. The most commonly eaten mushroom is button mushroom i.e., Agaricus. All the mushrooms are not edible.There are 2,000 species of edible mushrooms.

Edible mushroom: e.g., *Agaricus campestis, Agaricus bisporus etc.*

Poisonous mushrooms (Toadstools) *Amanita muscaria, A.phalloides* (death cup)etc.

Agaricus campestris

Amanita Phalloides



Poisonous mushrooms are usually brightly coloured.

2. Antibiotics

It is a chemical substance extracted from one living organism to kill or stop the growth of the other living organism. Such antibiotic, like Penicillin, is extracted from fungi, Penicilium and other common anitbiotics are Streptomycin, Neomycin, Kanamycin, Gentamycin and Erythromycin.

3.Vitamins

Fungi *Ashbya gospii* and *Erymothecium ashbyii* are used in the synthesis of Vitamin B-riboflavin

Fungal diseases

Human - Mycoses (growing on skin, nails, hair, organs), athletes foot, ringworm.

Animals - Ergot, athletes foot.

Plants - Rust, black rot, black spot, canker.

ACTIVITY 4.2

- Observe the mushrooms that grow after the rain in your area. Note down their colour, shape and various parts.
- Visit a near by mushroom cultivation centre and learn the process of cultivation.

MORE TO KNOW

Claviceps purpuria – Hallucinogenic fungi cause the greatest damage to the frustrated youth by giving unreal, extra ordinary lightness and hovering sensation.

Aspergillus cause allergy to children while cladosporium protects against allergy.

4.2. FLOWERING AND NON FLOWRING PLANTS

The plants in this world are classified into flowering and non-flowering plants. The classification of kingdom plantae is given below

Kingdom Plantae

- **Non – Flowering (Cryptogams) Plants**
  - **Algae**
  - **Bryophyta**
  - **Pteridophyta**
- **Flowering (Phanerogams) Plants**
  - **Gymnosperms**
  - **Angiosperms**

Non flowering plants

4.3. ALGAE

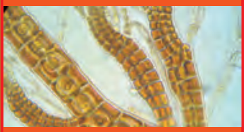
1. They are green water plants called algae. They are lowest and simplest primitive plants. Their body is not differentiated into root, stem or leaf.
2. They may be unicellular, multicellular, filamentus or branched and tree like.

1. They posses chlorophyll and can prepare their own food.
2. Their cell wall is made up of cellulose.
3. Algae reproduce by
   - **vegetative reproduction** (fragmentation) e.g. *spirogyra*
   - **Asexual reproduction** (Spores)

- Sexual reproduction
- Scalariform conjugation and Lateral conjugation e.g., *Spirogyra*
- By producing sex organs Antheridia and archegonia e.g., *Chara.*

Classification of Algae

Algae have photosynthetic pigments which may be green, brown, red or blue green according to the dominant pigment present in them.They are classified on the basis of their colour as given below.

S.No.	1	2	3	4
Colour	Blue-green	Green	Brown	Red
Pigment	Phycocyanin	Chlorophyll	Fucoxanthin	Phycoerythrin
Class	Cyanophyta	Chlorophyta	Phaeophyta	Rhodophyta
Reserve Food	Cyanophycean Starch	Starch	Laminarian	Floridean Starch
Example	Oscillatoria	Chlamydomonas	Sargassum	Polysiphonia 

ACTIVITY 4.3

Collect some pond water along with algae and observe under the microscope.

MORE TO KNOW

The California giant kelp (brown marine algae) is the fastest-growing sea weed (15 cm/day & 160ft/year).

Uses of Algae

1. Food

- The following algae are used as food by human being, domestic animals and fishes. e.g., *Ulva, Laminaria , Sargasm, Chlorella*

2. Agar Agar

- This substance is obtained from the red algae e.g., *Gelidum* and *gracillaria.*
- It is used to make ice creams.
- It is used as culture medium for growing plants in test tubes. (Tissue culture)

3. Iodine

- It is obtained from Laminaria a brown algae.

4. Algae in space travel

- Chlorella pyrenoidosa is used in space travel to get rid of CO_2 and other body waste and it also decomposes human urine.

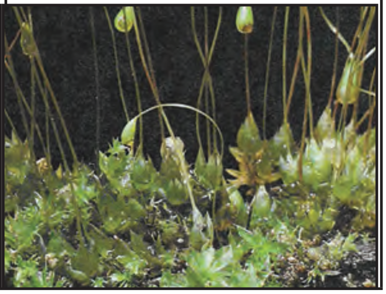
4.4. BRYOPHYTES

The trees and rocks of hilly areas are covered by thick green carpet of tiny plants. They are the first plants to come out of water to get adapted to live on the land. But can reproduce only in the presence of water.

- The mosses has root like stem like and leaf like structure.
- They have alternation of generation. (Sporophytic phase alternates with the Gametophytic phase)
- They reproduce sexually by gametes and asexually by spores, gemma and fragmentation.
- They live both on land and water so they are called amphibious cryptogams.

Classification of Bryophyta

Class – Hepaticae	Class – Anthocerotae	Class – Musci
▪ Undifferentiated thallus ▪ Protonemal stage absent e.g.,Riccia	▪ Sporophyte is differentiated in to seta and capsule ▪ Protonemal stage absent e.g. Anthroceros	▪ Differentiated into root like stem like leaf like organs. e.g. Funaria



Uses of Bryophytes

- Peat moss or sphagnum in dried condition is used as fuel.
- Sphagnum is also used as antiseptic and absorbent bandage in the hospitals.
- Sphagnum is also used as seed bed and in green houses.
- Bryophytes control soil erosion as they form a carpet over the soil.

MORE TO KNOW

Sphagnum moss was once used in disposable diapers because it soaks liquid well.

ACTIVITY 4.4

Let us visit a nearby nursery of plants and observe the horticultural methods, where they use Sphagnum.

4.5. PTERIDOPHYTES

The first successful group of cryptogames to live on the land llike vascular system are pteridiphytes. They are called vascular cryaptogams (xylem and phloem to conduct water and food). These plants are living since the Jurassic period.

- Leaves are called as fronds (sporophylls) They bear sporangia on the ventral [lower] side
- The leaves are dimorphic [two types of leaves] in selaginella
- Stem is a rhizome. They are seedless true land plants
- They reproduce by means of spores
- Spores may be homosporous or heterosporous Sporophyte alternates with the gametophyte

Pteridophyta

- Psilopsida e.g., Psilotum
- Lycopsida(Club mosses) e.g., Lycopodium
- Sphenopsida(Horsetails) e.g., Equisetum
- Pteropsida e.g., Nephrolepis

Uses of Pteridophytes

- Grown as ornamental plants for their beautiful fronds.
- Marselia is used as food
- Dryopteries is used as vermifuge.
- Lycopodium powder is used as medicine.

Flowering plants

Angiosperms

Gymnosperms

4.6. GYMNOSPERMS

- Plant body is differentiated in to root ,stem and leaf.

- Well developed tap root system
- Leaves vary in nature
- Gymnosperms undergo secondary thickening
- They have two phases in its life cycle. Sporophytic and Gametophytic phase
- Most of the Gymnosperms produce male and female cones

Classification of gymnosperms

1.Cycadales:- e.g.,cycas

- Palm like small plants (erect and unbranched)
- Leaves are pinnately compound forming a crown
- Taproot system have coralloid roots

2.Ginkgoales:- e.g., Ginkgo biloba

Cycas tree

- It is the only living species of the group
- It is a large tree with fan shaped leaves.
- They produce offensive smell.

Ginkgo biloba

3. Coniferales:- e.g., Pinus

- Evergreen trees with cone like appearance
- Needle like leaves or scale leaves
- Seeds are winged

Pinus tree

4. Gnetales:- e.g., Gnetum

- Small group of plants with advanced characters
- Ovules are naked present on flower like shoot

Gnetum

Uses of gymnosperms

Pine, Rose Wood, Fir, Cedrus → Furniture, Pencil and Match stick

1. Timber, oils and resins are produced from *pinus*. Resins are used in the manufacturing of paints, oinments and varnishes.

2. *Ephedra* → Ephedrine (Alkaloide) → cures asthma

3. *Gnetum* → cures rheumatism. *Agathis* → paper pulp → paper.

4. Monkey's puzzle (*Araucaria*) → evergreen ornamental plant.

4.7. ANGIOSPERMS

1. Angiosperms are flowering plants forms one of the major group of seed plants with atleast 26,000 living species.
2. They occupy every habitat on earth except extreme environments. They can be small herbs, shrubs, lianes or giant trees.
3. Conducting tissues (xylem and phloem) are present.
4. secondary growth is observed (formation of bark).
5. Ovules are enclosed within the carpels of ovary Which later gets modified in to fruit. Ovules become seeds and seeds have cotyledons.

Angiosperms are crucial for human existence. They are the sources for food, clothing fibres, medicine and timber.

Classification of angiosperms

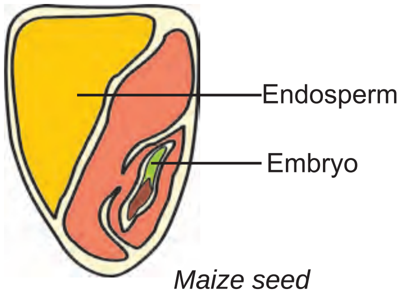
Classification of angiosperms → Monocotyledons, Dicotyledons

ACTIVITY 4.5

Take few gram seeds and maize, soak them in water. After sometimes dissect and observe.

4.8. MONOCOTYLEDONS

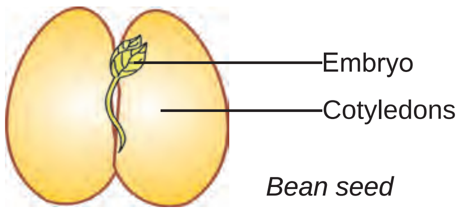
The plants which have seeds with only one cotyledon are called as monocotyledons. e.g., grass, paddy, maize, wheat



Maize seed

4.9. DICOTYLEDONS.

The plants which have the seeds with two cotyledons are called as dicotyledons. e.g., bean, pea, mango.



Bean seed

Morphology of dicot and monocot plant

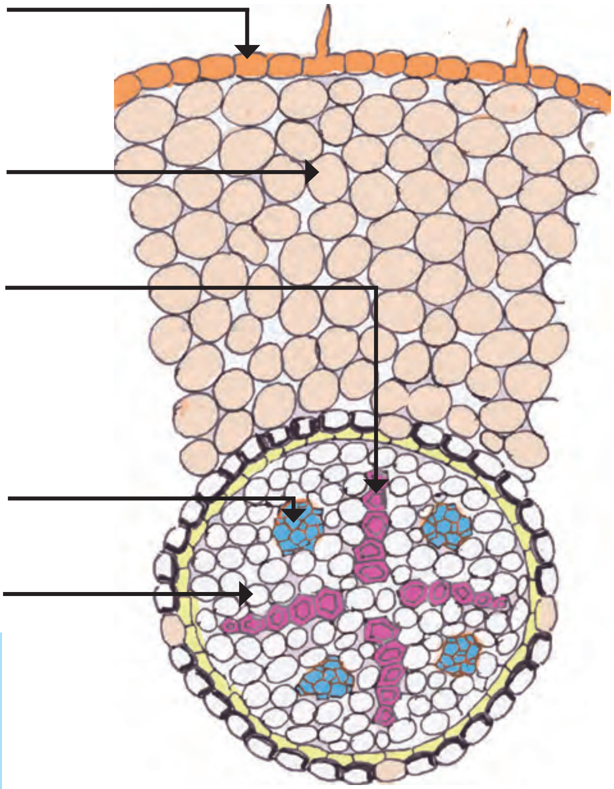
Parts of the plant	Dicot	Monocot
Root	Tap root system	Fibrous root system
Leaf	Reticulate veination	Parallel veination
Flower	Calyx and corolla are differentiated eg. Mango, Neem. Floral parts are in the sets of 4 or 5.	Calyx and corolla not differentiated but fused to form perianth. Floral parts are in the sets of 3.

ACTIVITY 4.6

Pull out a grass plant and a small Acalypha plant. Observe the morphological difference between dicot and monocot.

4.10. STRUCTURE OF ROOT

- The outer most layer of the root is rhyzodermis. It gives rise to unicellular root hairs.
- The next layer is cortex, helps in conduction and storage.
- The xylem vessels transport water from roots to various parts of the plant.
- The phloem vessels translocates food from leaves to other parts of the plant.
- There is a conjunctive tissue between xylem and phloem.
- Pith is the centre part of the root. It is present in monocot and absent in dicot it helps in storage.



T.S. of Dicot root

Many xylem bundles in monocot (Polyarch)
Four xylem bundles in dicot (Tetrarch)

4.11. STRUCTURE OF A STEM

- Culticle - waxy coating
- Epidermis - barrell shaped cells, gives protection and produces multi cellular epidemal hairs
- Cortex- it is divided into three layers.

Collenchyma – thick walled, gives mechanical support.

Chlorenchyma - thin walled, filled with chlorophyll and helps in photosynthesis.

Parenchyma - thin walled, helps in storage and ventilation.

- Endodermis (Starch Sheath) – barrell shaped, helps in protection and conduction.
- Pericycle - parenchyma alternates with shlerenchyma
- Vascular bundle

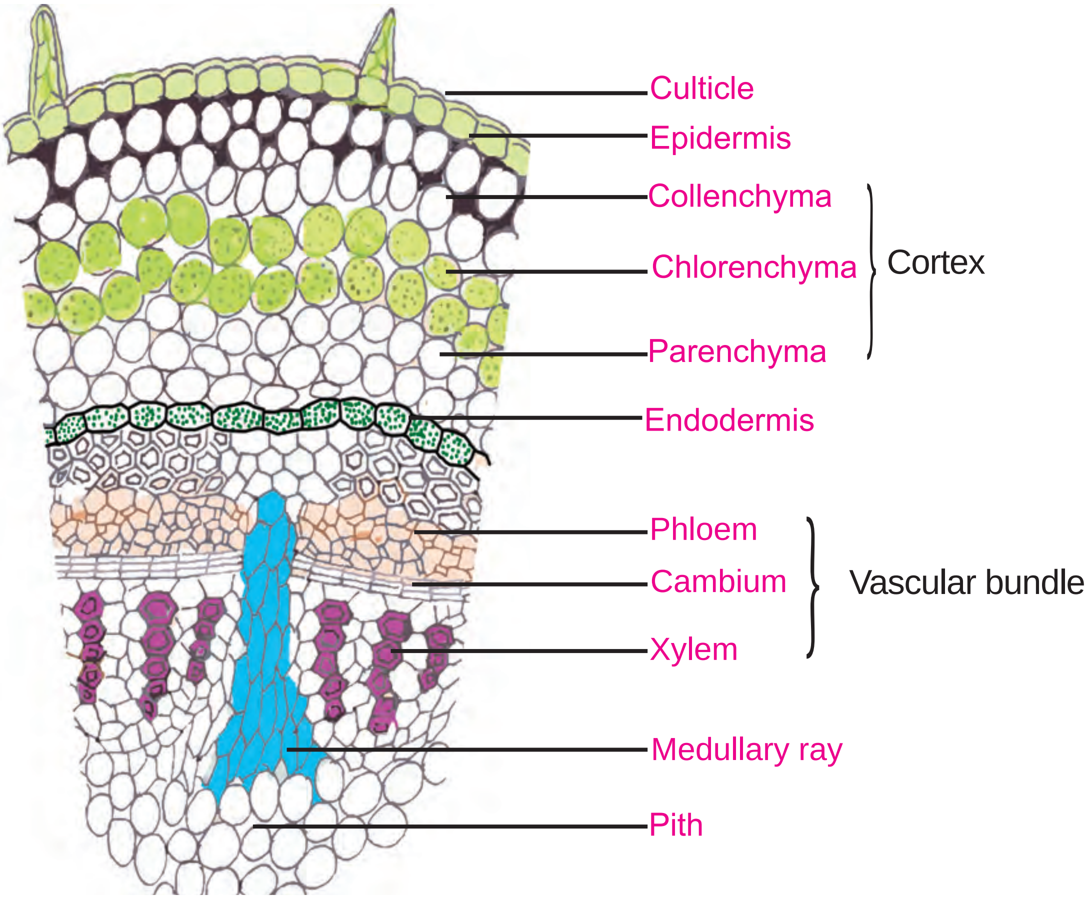
Phloem - Translocates food

Cambium - secondary growth

Xylem - conducts water

Medullary ray- extends between vascular bundles

- Pith- helps in conduction



T.S of Dicot stem (Sunflower)

4.12. STRUCTURE OF LEAF

- Cutcle – Outermost layer.
- Upper epidermis – Barrel shaped cells. Helps in protection.
- Mesophyll tissue

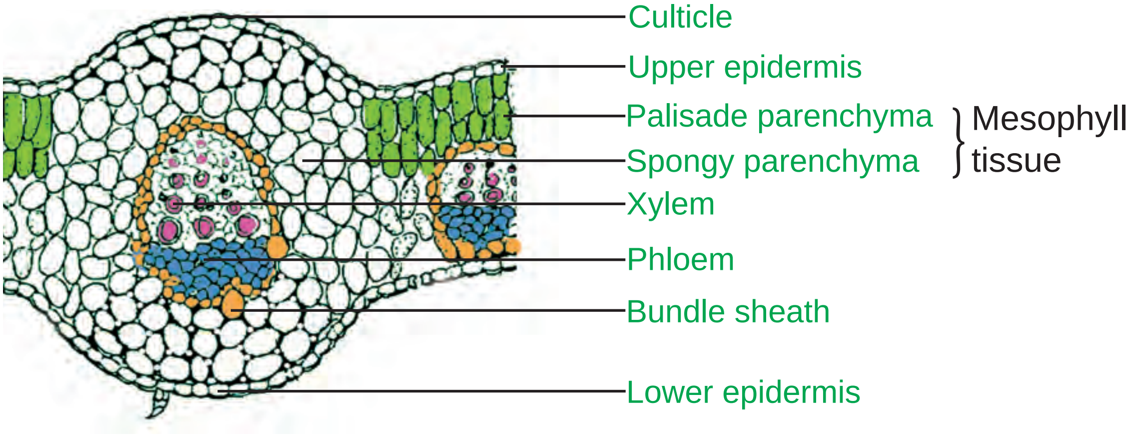
Palisade parenchyma – cylindrical cells have choloyphyll and helps in photosynthesis.

Spongy parenchyma – oval or round shaphed without cholorophyl helps in storage and conduction.

- Vascular bundle - xylem conducts water, phloem translocates food.
- Lower epidermis – barrel shape , have stomata,helps in exchange of gases and transpiration.

Isobilateral – (either spongy or palisade parenchyma are present) in monocot.

Dorsiventral – (both palisade and spongy parenchyma are present) in dicot.



T.S of Dicot leaf (Sunflower)

EVALUATION

1. Choose the correct answer

a) An example of saprophyte. (Puccinia / Agaricus) ________________

Agar-agar is obtained from (Gelidium / Chlorella) ________________

b) _______ is a palm like Gymnosperm. (Cyca / Pinus)

c) The algae which decomposes human urine is ________________ _____[spirullina/chlorella]

d) ___________are called as amphibious cryptogams

2. Reason Out In Short

a) Pteridophytes are vascular cryptogames.

b) Antibiotics are extracted from bacteria and fungi. They stop the growth of micro organisms and cure diseases. Give any two antibiotics obtained from fungi.

3. How are the following organisms called?

a) Algae prepare their own food.

b) Fungi either depend on living organisms or non living things for their food.

c) An organisms having both algal and fungal characters

4. Name the fungai

A

B

5. a) Match the following

i)	Algae	—	Nephrolepis
ii)	Bryophyta	—	Chlamydomonas
iii)	Pleridophyta	—	Riccia

b) I am a true terrestrial plant. I have root, stem, leaf. I reproduce through spores but I don't have flowers. Who am I? Explain :-

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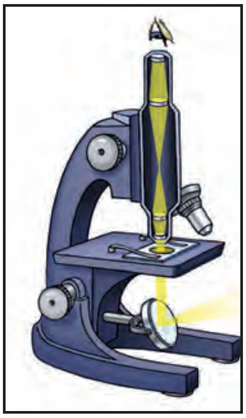
CHAPTER 5

MICRO ORGANISMS

5. MICRO ORGANISMS

Vijay brings his microscope in to the class room. He shows an empty glass slide and another micro slide specimen and he permits his friends to observe.



Light Micro Scope

Vijay:- Do you see any thing in the micro-slide?

Sheelan:- Yes, it is an amoeba on the slide.

Vijay:- Today we shall learn more things about micro-organisms through the internet.

As both of them started browsing the internet about micro-organisms, they started getting information about micro-organisms.

Living organisms show a great degree of diversity in their size. A considerable number of species are not visible to the naked eye. They can be seen only with the help of a microscope. Such organisms which can be seen through a microscope are called micro organisms.

They are measured in microns and millimicrons. Example: Virus, bacteria, algae, fungi and protozoan like ***Amoeba, Plasmodium*.**

5.1. VIRUS

Virus is a Latin word which means **poison.** Viruses are the smallest and simplest of all living organisms. The study of viruses is called **Virology.** Viruses show both living and non-living characteristics. They are considered

Micro Organisms

Virus | Bacteria | Fungi | Algae | Protozoan

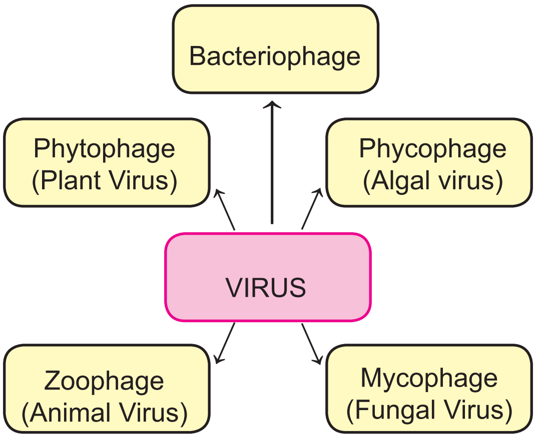
Virusus are puzzle to biologists why?

Virus was discovered by Ivanowsky, a Russian Botanist in 1892.

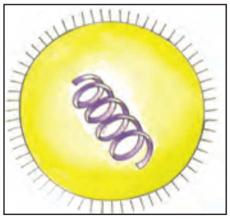
Ivanowsky

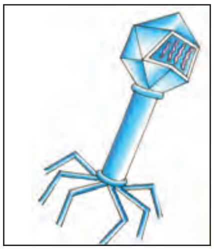
as being on the border line between living and non-living organisms. The living cell inside which the virus grows and multiplies is known as host cell. Outside the host cell, viruses do not show any of the characteristics of living organisms.

Based on their host, viruses are classified in to five types.



TMV


Influenza Virus


T2 Bacteriophage

Adeno Virus

BACTERIA

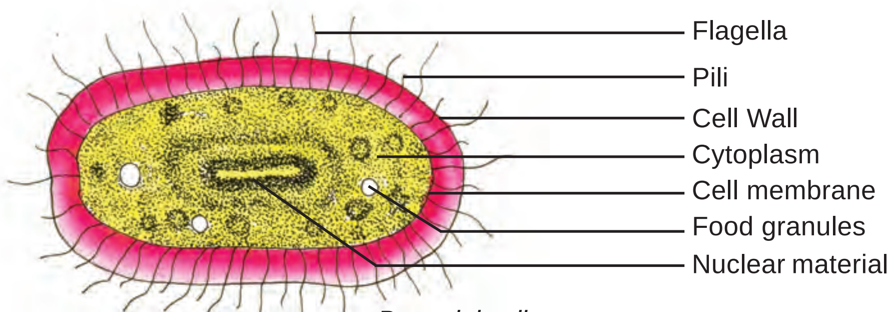
The curd contains *Lacto bacillus* bacteria which helps to change the milk into curd. Let us now study about bacteria. Bacteria are unicellular and microscopic, belonging to the world of microbes. The study of bacteria is called **Bacteriology.** Bacteria were first observed under a microscope by the Dutch Scientist Anton Von Leeuwenhoek in 1675. Later, Louis Pasteur, Roberts Koch and Lord Lister carried out detailed studies on bacteria.

ACTIVITY 5.1

Have you seen your mother adding a little curd to warm milk to set the curd for the next day? Why?

The structure of bacteria can be studied with the help of an electron microscope. The bacterial cell is a prokaryotic cell. It has a rigid cell wall protecting the cell and giving a definite shape to it. The living material inner the cell wall is called protoplasm. It is differentiated into cell membrane, nuclear material and cytoplasm. Membrane bound organelles like golgi bodies, mitochondria, endoplasmic reticulum, lysosomes are absent. It contains bacteriochlorophyll

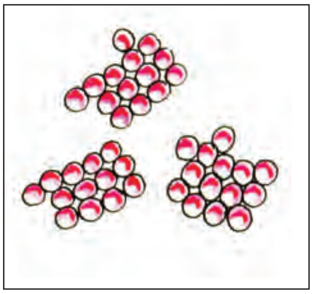
Anton Von Leeuwenhoek



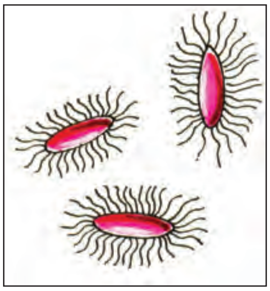
Bacterial cell

pigments. The nuclear material of a bacterial cell is made of a circular, DNA molecule. It is not bound by nuclear membrane. There are thread like appendages which are called flagella, the organs of motility. Pili are minute, straight, hair like appendages and are considered to be organs of attachment.

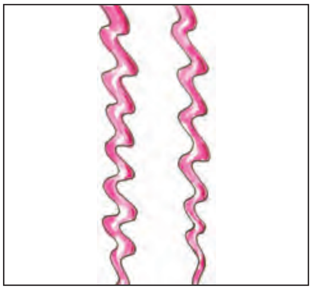
Bacteria are measured in microns. 1 micron = 1/1000 millimetre.



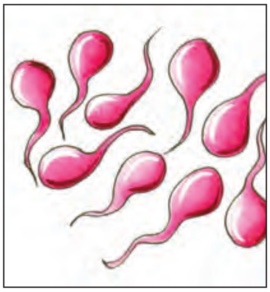
1. Cocci (Spherical shaped)



2.Bacilli (Rod shaped)



3. Spirillum
(Spiral or cork screw)



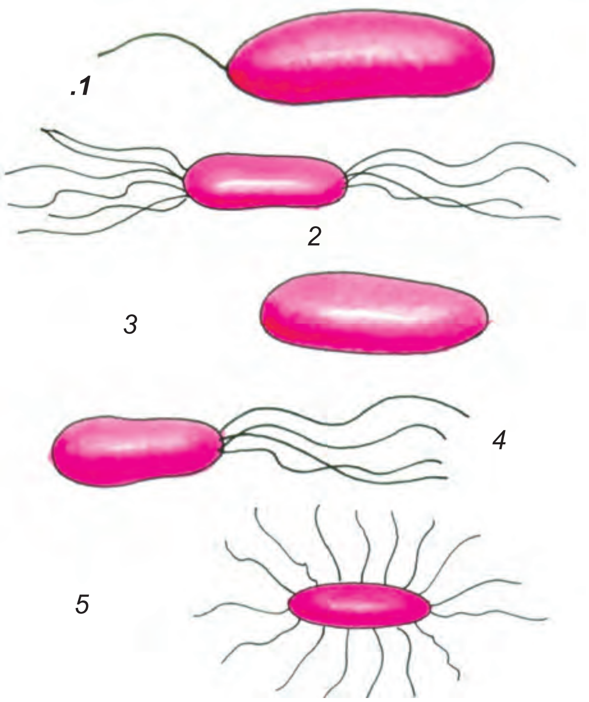
4.Vibrio (Comma Shaped)

Four types of bacteria are recognised based on shape. They are

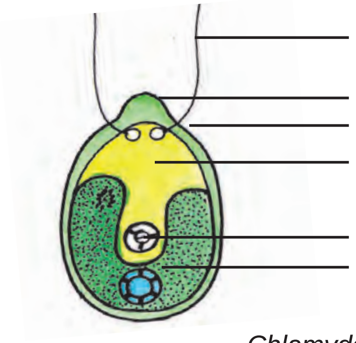
1. Cocci (Spherical shaped)
2. Bacilli (Rod shaped)
3. Spirillum (Spiral or cork screw)
4. Vibrio (Comma Shaped)

On the basis of the number and arrangement of the flagella, bacteria are classified as

1. Monotrichous (Single flagellum at one end)



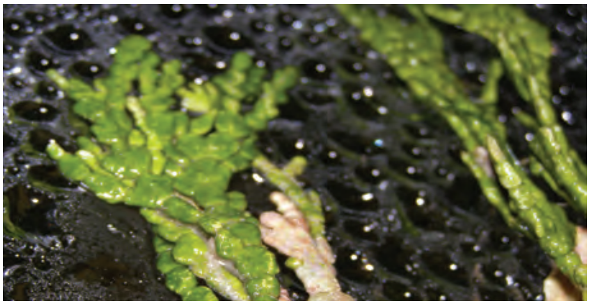
2. Amphitrichous (Tuft of flagella arising at both ends).
3. Atrichous (Without any flagella).
4. Lophotrichous (Tuft of flagella at one ends).
5. Peritrichous (Flagella all around).



Chlamydomonas

ALGAE

Chlamydomonas is a unicellular green algae. It is spherical or oval in shape. The protoplasm is surrounded by a cellulose cell wall. The cell wall may have a pectic sheath around it. There is a single large cup-shaped chloroplast. Inside the chloroplast a pyrenoid which contains starch may be present. There are two flagellae at the narrow end of the cell which helps in locomotion. There may be a vacuole at the base of the flagella. An eye spot is located at the anterior



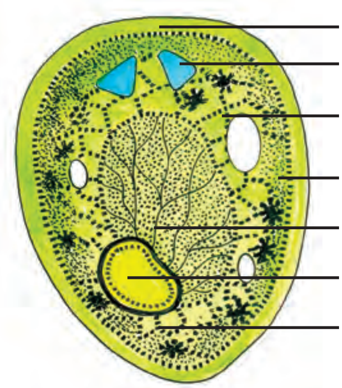
end. Based on the presence of other pigments, algae are classified into four classes. The study of algae is called **Phycology** which you have studied in the previous chapter.

FUNGI

The conversion of sugar solution into alcohol and liberation of carbon di - oxide is known as **fermentation**. Here the sugar solution is fermented and gives a smell. Wine, alcohols are prepared from the molasses by the fermentation activity of the yeast. etc.

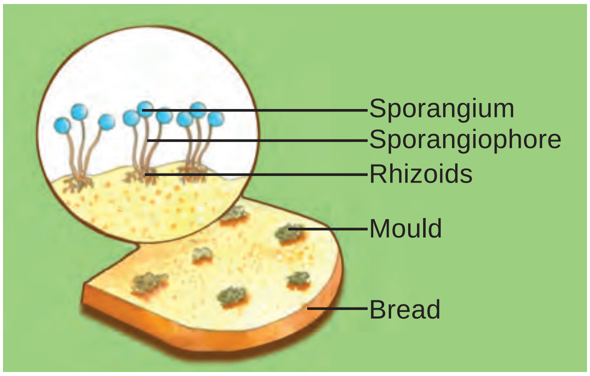
ACTIVITY 5.2

Take a 250 ml beaker filled up to ¾ with water. Dissolve 2 table spoon of sugar in it. Add a pinch of yeast powder to the sugar solution. Keep it covered in a warm place for 4 –5 hours. Now take and smell the solution.



Yeast cell

Keep a bread slice in a moist place. Observe if there is any change in colour. Why?



Bread mould

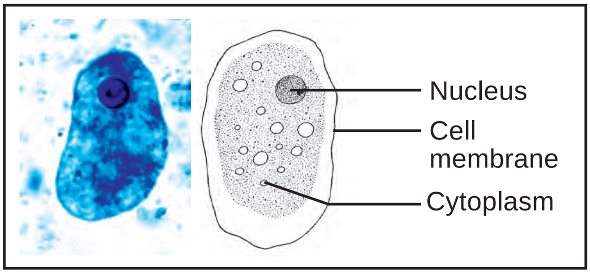
Yeast is a unicellular, saprophytic fungus. The cell is oval shaped. The nucleus is seen at one end of the vacuole. The cytoplasm shows the presence of organelles like endoplasmic reticulum, ribosome, mitochondria, etc., Fungi do not possess chlorophyll. Hence they are incapable of photosynthesis. The study of fungi is called **Mycology**. They lead a parasitic or saprophytic mode of life.

A black powdery spot with a network of thread like filaments, called hyphae is called mycelium (bread mould) which changes the colour of the bread.

Entameoba histolytica - Amocbic dyscentery

Plasmodium vivax } Malaria
Plasmodium falciporum }

Trypanosoma gambiense - African sleeping sickness



Entamoeba histolyitica

PROTOZOA

Protozoans are unicellular organisms. Metabolic activities are done by organelles. Protozoans show mainly two modes of life, free living and parasitic. Free living organisms inhabit fresh and salt water. Parasitic forms live as ectoparasites or endoparasites. They cause diseases.

5.2. USES OF MICRO ORGANISMS IN MEDICINE, AGRICULTURE, INDUSTRY AND DAILY LIVING.

Micro-organisms are used in the manufacture of antibiotics, linen,

MORE TO KNOW

When a cut or wound occurs in your body, you will be treated by the doctor. Your body temperature is recorded. If you have fever, doctor will give you some **antibiotic.**

Alexander Fleming of Britain in 1928 discovered the 'Wonder' Drug 'Penicillin'.

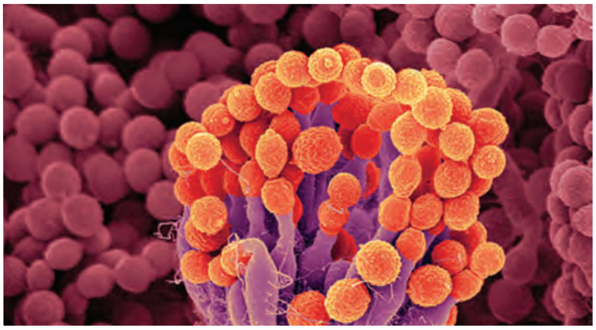
Alexander Flemming

bread, wine, beer and the other industries. Microorganisms are used to enrich the soil fertility.

What is antibiotic?

Antimicrobial agents which are useful medicines or drugs and are extracted from the micro-organisms are called **antibiotics**. Bacteria, Fungi are used to make antibiotics, vaccines, etc.

Name of the Species		Antibiotic
Bacteria	*Streptomyces griseus*	Streptomycin
	Bacillus subtilis	Bacitracin



Penicillium notatum

Fungi	*Penicillium notatum* *Penicillium chrysogenum*	Penicillin

Penicillin

Have you observed dead plants, small dead animals in your surroundings? What happens to them? Do they emit smell? Why?

AGRICULTURE

It may be defined as the science or practice of farming. Agriculture depends on soil fertility. Micro-organisms like bacteria, fungi, few algae enrich the soil fertility. Nitrogen is essential for all life.

Agriculture :- The science that deals with the growth of plants and animals for human use is called agriculture.

Bacteria convert complex proteins in the dead bodies of plants and animals into ammonia, nitrites and nitrates. Bacteria play a major role in the cycling of elements like carbon, oxygen, nitrogen and sulphur as biological scavengers. They oxidize the organic compounds and set free the locked up carbon as carbon di-oxide due to which we smell the foul odour.

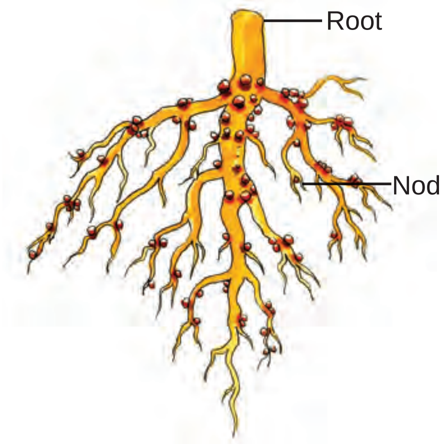
Farming

The following bacteria are involved to enrich the soil fertility:

Ammonifying bacteria:- e.g., *Bacillus ramosus*

Nitrifying bacteria:- e.g.,*Nitrobacter Nitrosommonas.*

Nitrogen-fixing bacteria:- e.g., *Azatobactor, Clostridium, Rhizobium* (Root nodules bacteria). Various blue green algae like Oscillatoria, Anabaena and Nostoc increase the soil fertility by fixing atmospheric nitrogen.



Root nodule

Role of micro organisms in industry and daily living.

Let us know how we get a good flavour when we drink coffee or tea?

The leaves of tea, tobacco, the beans of coffee and cocoa are fermented by the activity of *Bacillus megaterium* to impart the characteristic flavour. This is called **curing.**

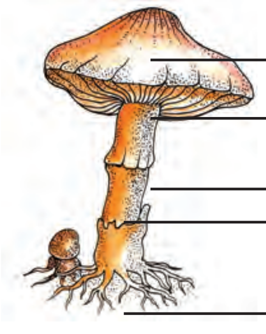
Vinegar is a good preservative. Pickles do not get spoilt. How do we get vinegar?

In the world today many industries totally depend upon the microbial activities of micro organisms such as Lactic acid bacteria.

Streptococcus lactis (lactic acid bacteria) converts milk protein into curd. Vinegar is manufactured from sugar solution employing *Acetobacter aceti*.

Butyl alcohol, methyl alcohols are prepared from molasses by the fermentation activity of *Clostridium acetobutylicum.* Alginic acid is obtained from brown algae.

Oxalic acid is the fermentation product of fungi *Aspergillus niger*. Yeast is the best source of vitamin B complex and vitamin Riboflavin. Mushroom is also an edible (e.g.) *Agaricus, Morchella* are edible and are cultivated.



Edible mushroom

Chlorella and *Spirulina* are used as protein sources. Hence they are known as **single cell protein**.

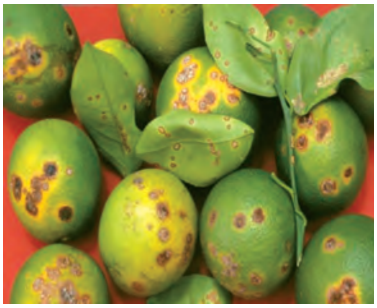
5.3. HARMFUL MICRO ORGANISMS

Micro organisms cause damage to the plants and food materials. They contaminate food, which leads to food poisoning. Influence of micro organism on plants and animals reduce the market value of their product. The various harmful activities of bacteria, fungi and virus are given in the table.

- Fruits. Vegetables, fish, meat, milk, etc., are perishable foods.
- Wheat, rice, maize, pulses, sugar are non-perishable foods. Some times food is unfit for our consumption. Why?

S. No	Micro-organisms	Name of the Species	Diseases
1	BACTERIA	*Xanthomonas citri* *Pseudomonas solanacearum* *Xanthomonas oryzae*	Citrus Canker Wilt of Potato Bacterial blight in Rice
2	FUNGI	*Cercospora personata* *Cercospora arachidicola* *Pyricularia oryzae*	Tikka disease of groundnut Blast disease of rice
3	VIRUS	Bunchy Top Virus Tobacco Mosaic Virus Cucumber Mosaic Virus	Bunchy top of Banana Tobacco Mosaic disease Cucumber Mosaic disease.

PLANT DISEASES



Citrus Canker

Blast disease of rice

Cucumber Mosaic disease

Microbes affect human lives and pose a challenge to human health. Health is wealth is just a saying. But today we hear of **Rat fever, Malaria, Swine Flu. Birds Flu**, etc., How do we get infected?

Viruses, bacteria, fungi, protozoa and certain worms are the main organisms causing diseases.

To cause disease, they must first gain entry into the body. Such entry must be either through the skin or through the nose into the respiratory system or through the mouth to the alimentary canal.

The method of carrying these disease organisms to the body is varied. The carriers of disease organisms are called vectors. They are said to transmit diseases.

Some organisms pass directly through the surface of the skin. Such is the case with the spores of the fungus which causes ring worm. Bacteria frequently enter the skin through a wound, causing inflammation of the wound.

Many micro-organisms enter through the nose or mouth and penetrate the delicate membranes of the respiratory system. Virus causing colds and influenza enter this way.

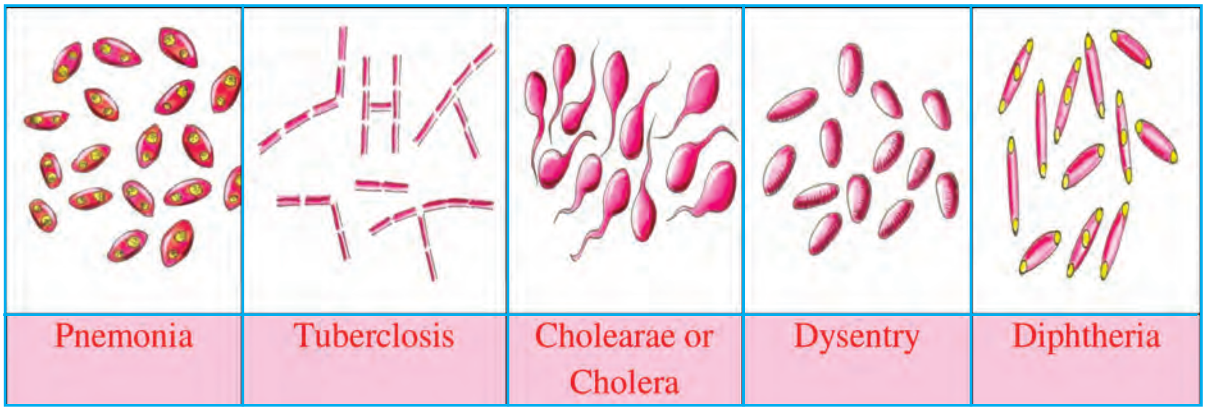
Parasitic bacteria, protozoans, viruses, etc., cause various communicable diseases in man.

Communicable diseases are pathogenic diseases which spread from, person to person, either directly or indirectly. The following table shows some of the common communicable diseases in man.

PATHOGEN	DISEASES	MODE OF TRANSMISSION
VIRUS	Common cold, Polio. Hepatitis, Influenza, Jaundice.	Air water, direct contact
	AIDS	Sexual Contact
BACTERIA	Cholera, typhoid	Contaminated water.
	Tetanus	Cuts and wounds
	Leptospirosis	Contact of animal's urine. (Rat and Squrriel)
	Leprosy	Contact (vector)
FUNGI	Athlete's feet	Spores in water and in ground.
PROTOZOAN	Malaria	Vector example mosquito

ACTIVITY 5.3

1. Collect the pictures of viral diseases in man.
2. Collect the pictures of fungal diseases in man.
3. Collect the pictures of bacterial diseases in man.
4. Collect the pictures of protozoan diseases in man.



Disease causing microbes

Harmful micro-organisms in food and drink can be taken in through the alimentary canal unless high standards of hygiene are followed. The food may be contaminated in a variety of ways. Bacteria may enter the food causing it to go bad, if food is not properly stored. The bacteria causing cholera and typhoid and the protozoan causing amoebic dysentery are easily picked up from the infected food and water.

Disease causing microbes

Due to chemical reaction, butter milk gets spoilt if kept in a brass vessel. The starchy foods get spoilt due to change of starch into sugars by the enzymes present in the food articles.

5.4. MICROBES IN FOOD PRESERVATION

Food preservation is the process of treating and handling food to stop or greatly slow down spoilage (loss of quality, edibility or nutritive value) caused or accelerated by micro-organisms. Canning, Pasteurization, refrigeration, dehydration, the use of preservatives, heating, boiling and drying are the effective methods of controlling micro-organisms.

Bottling and Canning

The right types of containers have to be chosen. They are then sterilized. Preservatives such as vinegar, sodium benzoate, oil, citric acid are added to the food stuff, which is then packed and sealed properly.

Milk pouch

- **Aavin milk** etc., that comes in packets is not spoilt. Why?
- This milk is **pasteurised.** What is Pasteurisation?

Pasteurisaton is used to preserve milk. Milk is heated to 72°C for 30 minutes and then suddenly cooled to 12°C. Microbes are killed without causing damage to the taste, quality of milk for a longer time and packed in polythene pouches.

Why do we keep fish, meat and vegetables with salt in the hot sun?

Dehydration: Fish, meat and vegetables with salt can be dried in the sun to reduce the moisture content and the growth of micro-organisms. These are dehydrated under controlled conditions.

5.5. RELATIONSHIP BETWEEN MAN AND MICROBES

Balances, imbalances and uses

All existing things in the world and the universe around it made up of five basic elements, the earth, water, fire, air and space.

Human life and the knowledge of science as growing concern, have come into being almost simultaneously. In the past, man found that living in large groups was to his advantage. In this way, he had much better protection from his enemies. Man involved himself in many group activities, as a result ended up with many problems. The greatest problems of today are disease, population growth and pollution. Today in our present time, it is too late for any preventive measures

because the diseases are already with us, and therefore, good medical services, conservation methods, and socio biological approachs are required.

Social Biology

Social biology is the study of how man lives with other men, with animals and plants and how he affects each of these.

Man ofcourse has developed his knowledge and understanding about microbes and to a greater extent and made use for his benefits in agriculture, soil fertility, medicine, industry and in genetic engineering.

Microbes are used as biological control. How?

Certain *Bacillus* species such as *B.thuringinsis* infect and kill the caterpillars of some butterflies and related insects. Since the bacteria do not infect other animals or plants they provide an ideal means of controlling many serious crop pests. This control measures is called as Biological control.

The role of microbes in genetic engineering

Viruses are used in eradicating harmful pests like insects. Vaccines are produced to prevent serious viral infections.

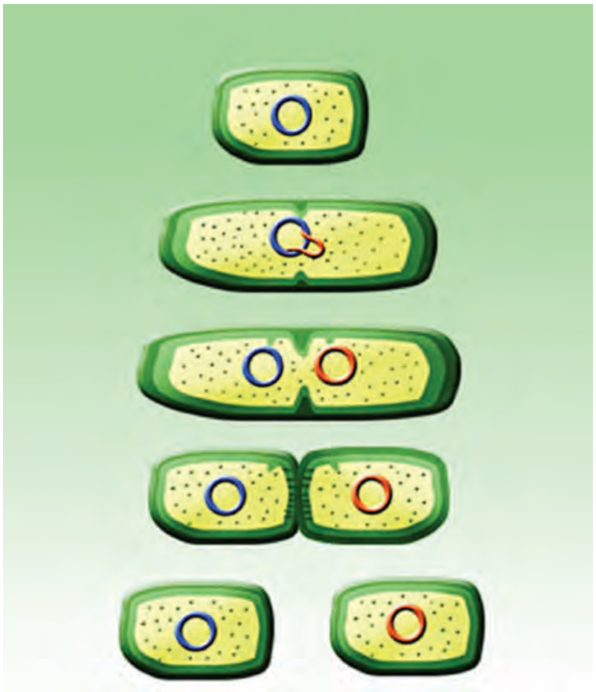
Viruses are useful too. Their ability to move genetic information from one cell to another makes them useful for cloning DNA and could provide a way to deliver gene therapy (transformation). In order to attain the desirable character such as insulin gene, nif gene the bacterial host such as *E.coli, Bacillus subtilis* and *streptomyces* are introduced.

Viruses are very much used as biological research tools due to their simplicity of structure and rapid multiplication.

Reproduction in bacteria by binary fission in which many bacteria multiply rapidly, explains the cause of spoilage of food stuffs, turning milk into curd, etc.

By conjugation method, the plasmid of donor cell, which has the fertility factor, undergoes replication. Fungi reproduce mostly by spore formation.

However sexual reproduction (conjugation) also takes place.



Binary fission in bacteria

ACTIVITY 5.4

Take two glass bottles and mark it A and B. Keep the vegetable waste, food wastes, in bottle A and cover the mouth of the bottle. Keep the damaged, plastic toys, metal toys in bottle B and close the mouth of the bottle with a lid. Observe the two bottles A and B after a week. Write your observation.

Saprophytic bacteria and fungi cause decay and decomposition of dead bodies of plants and animals. They release gases and salts to the atmosphere and soil. Hence, the micro-organisms like bacteria and fungi are known as Nature's scavengers many bacteria like *Rhizobium, Azatobacter* and *Clostridium* can fix atmospheric nitrogen as ammonia. This phenomenon is called **biological nitrogen fixation.**

Thus microorganisms maintain carbon, nitrogen and mineral cycles in nature.

The cyclic movements of chemicals of Biosphere between the organisms and the environment are referred as **Bio - geo cycle**.

Algal bloom: Under certain conditions, algae produce "blooms" i.e. dense masses of materials that cover the water surface, thereby decrease the oxygen content of water. This is followed by the death of aquatic organisms. Algal bloom leads to loss of species diversity which is known as **Eutrophication.**

Death of the coral reef in the ocean produces new pathogenic bacteria. Any septic operation theatre (Surgical arena) produces number of disease causing pathogens (disease causing microbes). Surgical wastes, medical wastes are dumped in catchment areas such as lakes, ponds and river banks cause communicable diseases.

Pathology is a science which deals with diseases of plants, animals and human beings caused by viruses, bacteria and fungi.

Man and microbes are in the biosphere. Man's interference with nature has caused imbalance in the biosphere. Man has to bring certain healthy changes in the field of agriculture and in industry in order to make a better habitat for his happy living with micro organisms. Let us start to create an eco-friendly nature for our better future.

Algal bloom

BIOLOGY

Earth provides enough to satisfy everyman's need, but not every man's greed. **- M.K. GANDHI**

- Butter milk gets spoilt if kept in a brass vessel. Why?
- The starchy foods get spoilt at room temperature if kept more than a day. Why?

EXTENDED ACITIVITY:

Two loaves of same kind of bread were purchased for a family. One loaf was set out in a basket for breakfast. The other loaf was refrigerated at once. Some of the bread in the basket was not eaten and was later refrigerated. The family went away on vacation for ten days. When they returned one of the loaves was covered with mould. The other was mould free. Which loaf do you think was mouldy?

Account for the differences in the loaves.

EVALUATION

1. Choose the best answer :

a). Algal bloom leads to loss of species diversity which is known as _______. (Eutrophication, Pasteurisation)

b). Which one of the following cause amoebic dysentery? (Entemoeba histolytica, Plasmodium vivax, Plasmodium felciparum)

c). Milk is heated to 72 oC for 30 minutes and then suddenly cooled to 12oC. Microbes are killed without causing damage to the taste and quality of milk. Name this process (dehydration, pasteurisation)

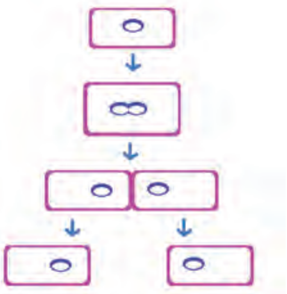
d). Nodules are responsilble for nitrogen fixation. Name the bacteria present inside the root nodules. (*Acetobactor, Rhizobium, Clostridium*)

2. Living organisms show a great degree of diversity in their size. A considerable number of species are not visible to naked eye. They can only be seen with the help of a microscope. How will you measure the size of micro organisms?

3. Fungi do not possess chlorophyll. Hence they are incapable of photosynthesis. So, they depend on either living organisms or non-living things. Name the two types of modes of nutrition in fungi.

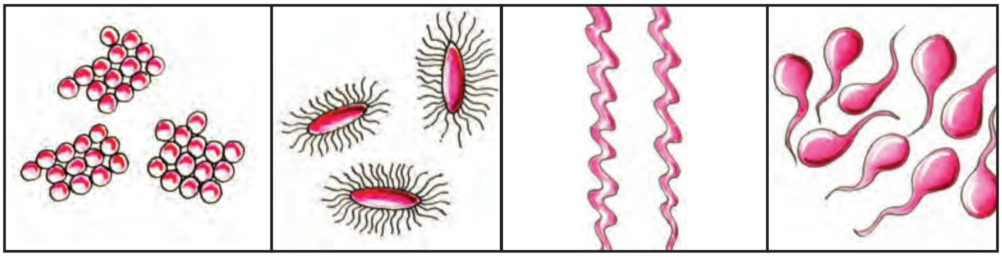
4. Communicable diseases are pathogenic diseases which are spread from person to person either directly or indirectly. Write the mode of transmission of the following disease.
   Cholera and typhoid
   Malaria

5. Find out the type of bacterial reproduction given in these diagrams.



6. The conversion of sugar solution into alcohol and liberation of carbon dioxide is known as fermentation. Which microorganism is responsible for this process?

7. i) Identify the following bacteria based on its shape.



   ii) Draw and label the following parts of the bacteria.

   a) Flagella b) pili c) cell wall cytoplasm cell membrane

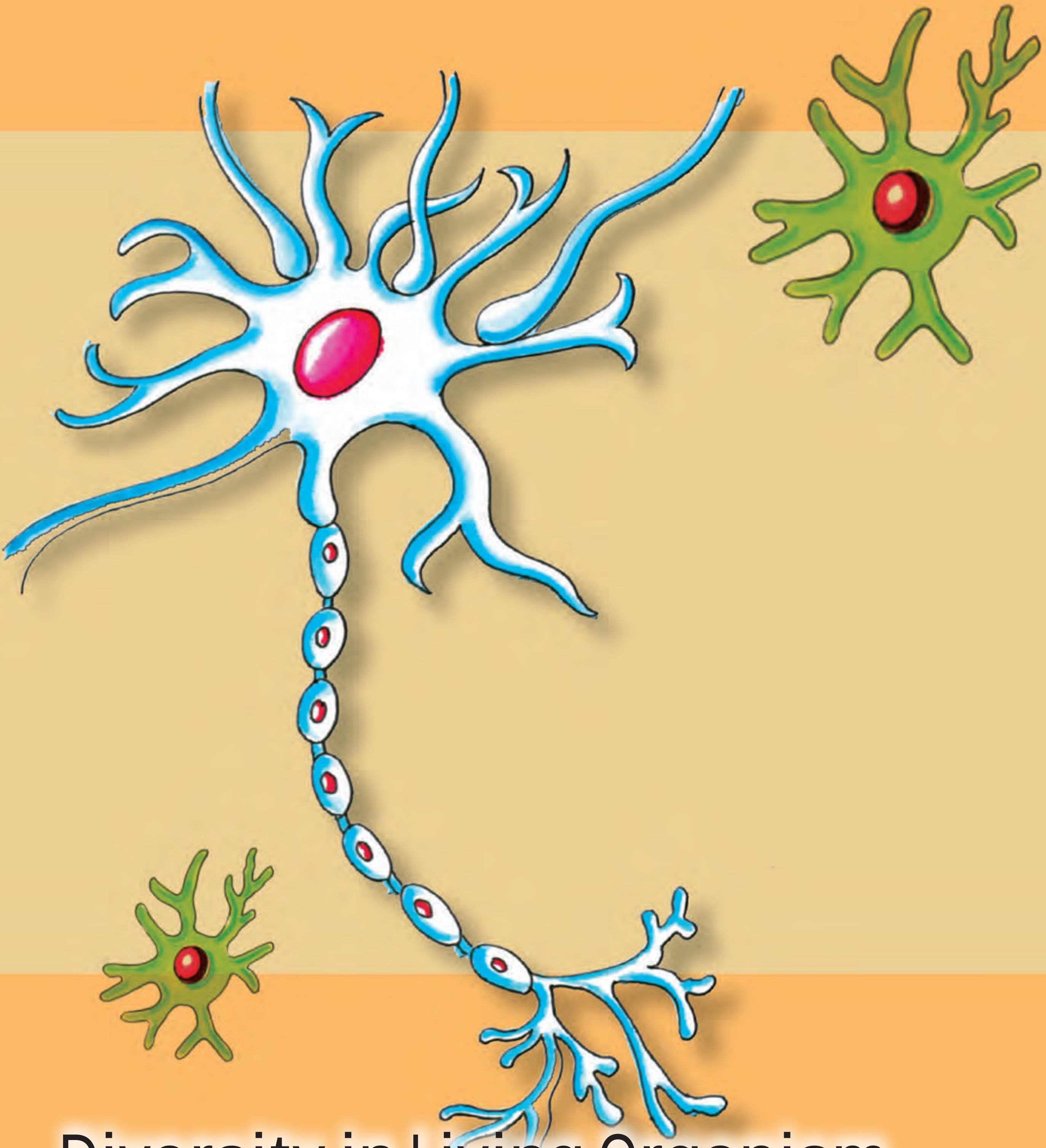
8. In the world today many industries totally depend upon the microbial activities. For example, oxalic acid is the fermented product of fungi Aspergillus niger. Name any two bacteria used in industry with their product.

9. Farmers consider microorganisms such as bacteria, fungi and virus a menace on their fields and gardens because they cause disease to their crops. Name any one of the bacterial disease, viral disease and fungal disease.

FURTHER REFERENCE

Books	Biology – Oxford – A modern introduction, B.S. Beckett - Oxford university press second Edition.
	Biology- Wallace, Sanders and Ferl - Harper collins college publishers.
Websites	www. en.wikipedia.org/wiki/micro organism.

CHAPTER 6



Diversity in Living Organism

6. DIVERSITY IN LIVING ORGANISM

Look at some of the plants and animals around you. Do they have the same shape and size? No, they differ in their size, shape and structure.

Our world is filled with many varieties of living organisms. Animals vary in size from the tiny amoeba to the huge blue whale. However, their bodies are adapted for the way they live.

6.1. CELL AS A FUNDAMENTAL UNIT OF LIFE

Cell is the structural and functional unit of all living organisms. Cell was discovered by Robert Hooke in 1665.

Theodor Schwann and Jacole Schleiden postulated the cell theory in 1838. The two important postulates of the cell theory are

1. All living organisms are made up of cells.

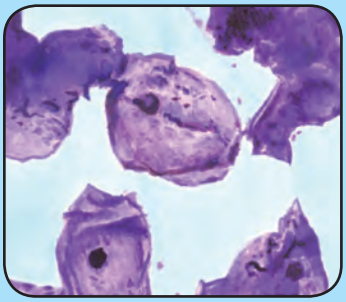
2. New cells are formed only from the pre-existing cells.

6.1.1. Types of Human Cells Related to Function

Based on the function, the size and the shape of the cells differ. Generally, cells are round, spherical or elongated. Some cells are long and pointed at both ends. They exhibit a spindle shape. Cells, sometimes, are quite long. Some are branched-like the nerve cell or a neuron. The following Table shows the various types of cells and their shape.

ACTIVITY 6.1

Observe the microscopic slides of epithelilum cell under a microscope and record the observations



Human cheek Cells

Example:-

Cells	Shape
Nerve cells	Star
Flame cells	Tubular
Gland cells	Cuboidal
Squamous epithelium	Polygonal
Columnar epithelium	Cylindrical
Egg cells	Oval
RBC	Round
Fibrous, Muscle cells	Elongated

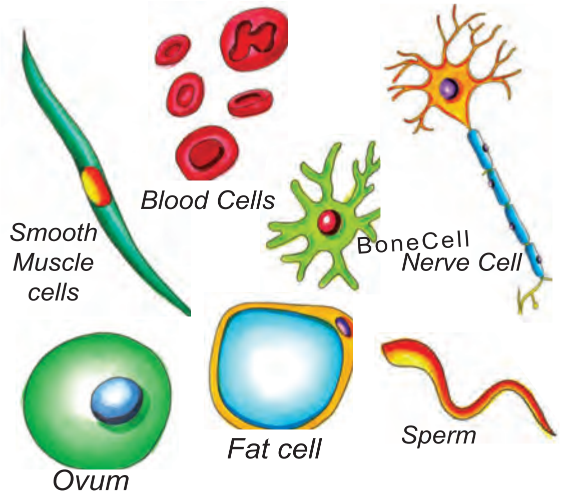
BIOLOGY

So, let us see some of the cells and their functions in human beings. Some of the human cells and their functions are listed below.

ACTIVITY 6.2

Prepare a chart showing the different parts of the cell and display it in your class room.

Cells	Function
Squamous epithelium	Protective & Shape
Muscle cells	Contractile & Retractile
Fat cells	Storing more fat droplets
Nerve cells	Conductions of nerve impulses
Bone cells	Rigidity
Rods and cone cells	Vision & colour
Ear cochlear cells	Conduction of sound waves
Gland cells	Secretory



Various cells from the human body

6.2. STRUCTURE AND FUNCTION OF CELL ORGANELLES

The cell organelles are present in the cell cytoplasm matrix. They are the living structures of the cytoplasm because they have properties of growth and multiplication at the time of necessity within the cell.

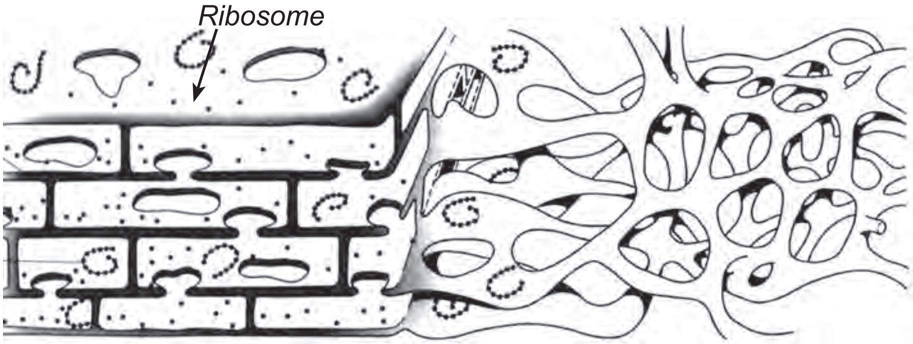
6.2.1. Cell Organelles and their Functions

The Cell Organelles are

1. Endoplasmic Reticulum
2. Ribosome
3. Golgi apparatus
4. Lysosomes
5. Mitochondria
6. Centrioles

1. Endoplasmic Reticulum

The electron microscopic study by Porter in 1945 revealed a network of membranous system with vacuoles in the endoplasm. This was named as endoplasmic reticulum by Porter in 1952. It is assumed that the endoplasmic reticulum originated by evagination of the nuclear membrane. Two types of endoplasmic reticulum have been observed. They are rough ER and smooth ER, based on the presence or absence of ribosome in the ER respectively.



Structure of Endoplasmic reticulum

Functions of Endoplasmic Reticulum

a. The endoplasmic reticulum provides an ultra structural skeletal frame work to the cell.

b. The smooth endoplasmic reticulum takes part in the synthesis of lipids and breaking down of glycogen.

c. During the cell division, the endoplasmic reticulum membranes disappear and form from new nuclear envelope after each nuclear division.

2. Ribosome

Many minute, spherical structures known as ribosomes remain attached with the membrane of endoplasmic reticulum and form the granular or rough endoplasmic reticulum. The ribosomes are produced in the nucleolus. Each ribosome is composed of two structural units, a smaller and a larger unit. The small sub-units occur on the larger unit and form a cap-like structure. The ribosome also may occur freely in the cytoplasm. They are the sites of protein synthesis.

MORE TO KNOW

Three researchers, who made the crystal structure of the ribosomes received the Nobel Prize for chemistry in the year 2009. **Venkatraman Ramakrishnan,** an Indian born U.S.A scientist. **Thomas Steitz** U.S.A and **Ada Yoath** of Isrel.

3. Golgi Apparatus

The electron microscopic observation of Golgi bodies reveals the presence of three membranous components,namely,

i. Disc shaped group of flattened sacs or cisternae

ii. Small vesicles

iii. Large vacuoles.

BIOLOGY

Functions

a. It produces secretory vesicles like zymogen granules that may have enzymes inside.

b. It forms the certain yolk substances in the developing oocytes.

c. It helps in retinal pigment formation in the retinal cells.

d. It helps in the formation of acrosome in sperm cells.

4. Lysosomes

Lysosomes are kind of waste disposal system of the cell. Lysosomes originate either from the Golgi apparatus or directly from the endoplasmic reticulum. Each lysosome is a round structure. It is filled with a dense material.

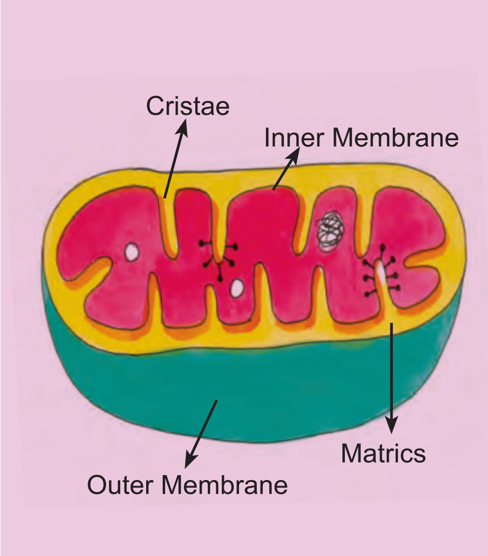
Functions

a. Lysosomes help to keep the cell clean by digesting any foreign material as well as worn out cell organelles.

b. When the cell gets damaged lysosomes may burst and the enzymes digest their own cell. Therefore lysosomes are also known as suicidal bags of a cell.

5. Mitochondria

In the cytoplasm of most cells, large size filamentous, rounded or rod-like structure known as mitochondria may be seen. The mitochondria are bounded by two membranes made of proteins. The outer membrane forms a bag like structure around the inner membrane which gives out many finger like folds on the lumen of the mitochondria. The folds of inner mitochondrial membrane are known as cristae.



Internal structure of Mitochondria

Function

Mitochondria are considered to be the power houses of the cell because they are the seat of cellular respiration. They also synthesize the energy rich compound ATP- Adinosine Tri Phosphate.

6. Centrioles

Centrioles were first described by **Henneguy** and **Leuhossek** in 1897. The Centrioles are micro tubular structures, found in two shapes-rod shaped and granules located near the nucleus of animal cell.

At the time of cell division, the centrioles produce the spindle fibres and astral bodies. They also decide the plan of cell division.

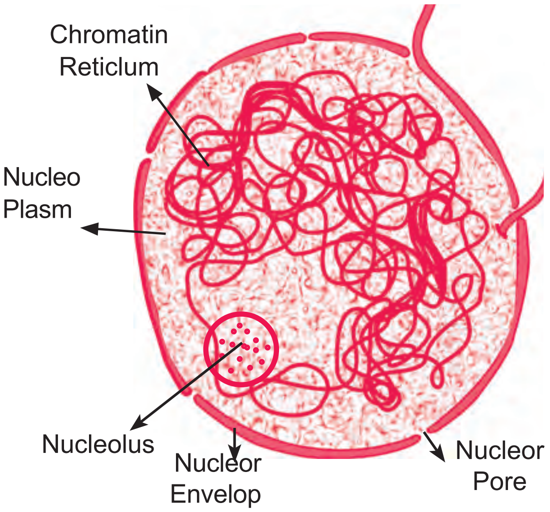
6.2.2. Nucleus

Nucleus is the most obvious sub cellular organelle. It is round or oval in outline and possesses four parts. They are :

1. Nuclear Membrane
2. Nucleoplasm
3. Chromatin Reticulum
4. Nucleolus

The nuclear membrane is the outer delicate covering of the nucleus. It contains pores of different dimensions.

The nucleoplasm is the protoplasmic substance of the nucleus. It is also known as nuclear sap. Chromatin Reticulum is composed of a network with highly elongated chromatin threads



Structure of Nucleus

which overlap one another and are embedded in the nucleoplasm. At the time of the cell division, the chromosomes become clearly visible.

The nucleolus is generally present in the nucleus of most of the cells. The nucleolus become enlarged during active period of cell division and are less developed in quiescent stage. It is often called as cell organizer

Functions

a. It controls all metabolic processes and hereditary activities of the cell.

b. The nuclear membrane allows exchange of ions between nucleoplasm and cytoplasm.

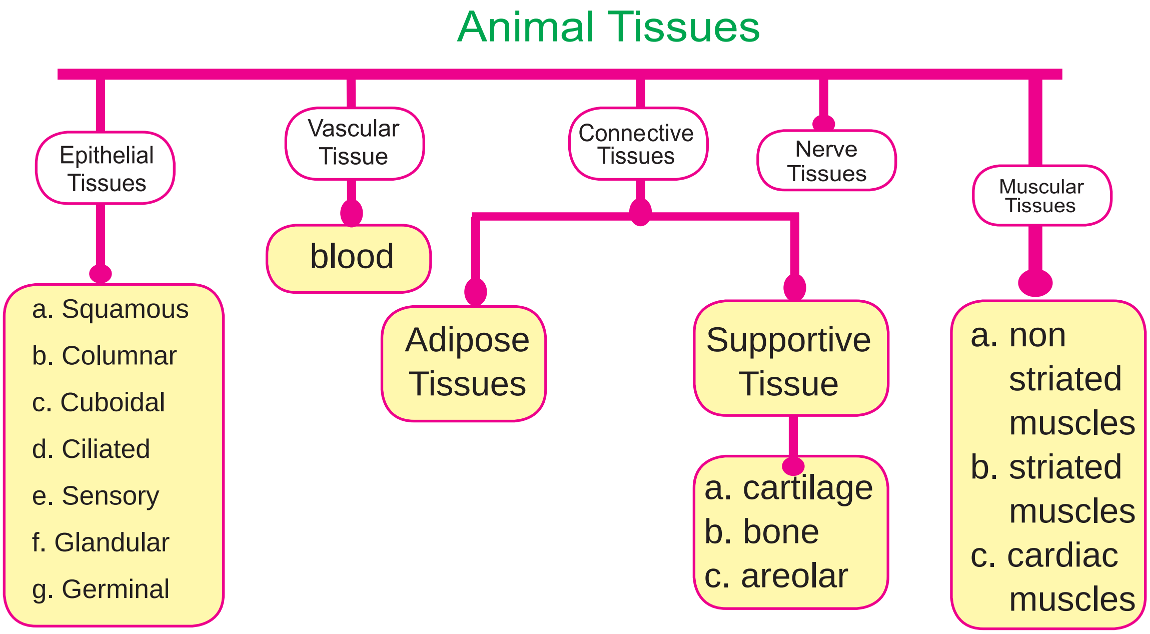
6.3. ORGANIZATION – CELLS – TISSUES – ORGANS – ORGAN SYSTEM

In multicellular animals, cells multiply by process of cell division and specilaise themselves to perform a particular function. For example, the muscle cells perform contraction and relaxation of organs that help in locomotion and conduction.

6.3.1. Tissues

A group of cells having common origin, structure and function is referred to as tissue.The bodies of animals are composed of several distinct tissues.

BIOLOGY



On the basis of the function, we can think of different types of animal tissues.

These may be classified into five broad categories.

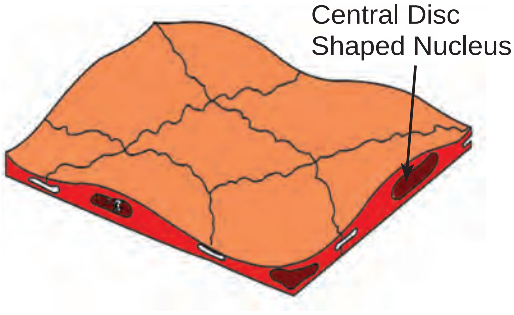
Epithelial Tissues

Epithelial tissues cover most organs and cavities with in body. Since the cells are closely packed, there is very little space between them and the absence of intercellular space is the characteristic of epithelial tissues. The cells in this tissue remain attached to the basement membrane that separates it from the other tissue.

Based on the shape, arrangement of cells and the functions, Epithelia are classified into seven types.

A. Squamous Epithelium

Squamous epithelium consists of single layer of flattened cells with central disc like nucleus. The inner lining of the cheek and the membranes within the body are examples for this epithelium.



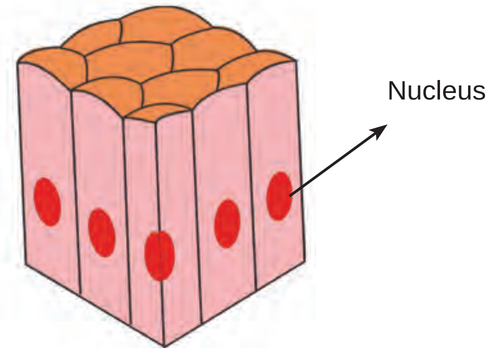
Squamous epithelium

Function

Protection is their function. In the alveoli they help in exchanges of gases.

B. Columnar Epithelium

The cells are cylindrical and tall, the height of each cell being greater than its width. The oval nuclei are usually found at the base of these cells. Example - the inner lining of the intestine.



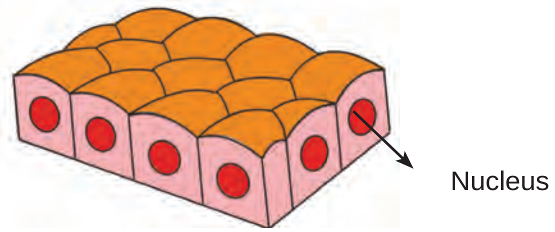
Columnar Epithelium

Function

Secretion of enzymes in the stomach and absorption of digested food in the intestine.

C. Cuboidal Epithelium

The cells of this epithelium are cube shaped. The walls of the ducts and the glands are examples.



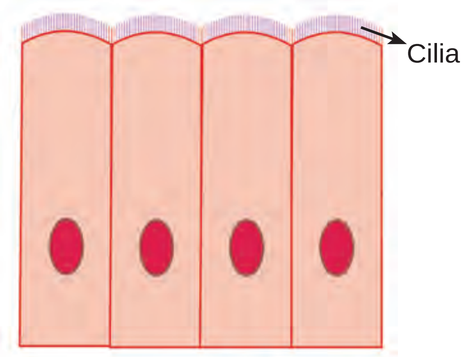
Cuboidal Epithelium

Function

The tissue helps in secretion and re-absorprtion of water in kidney tubules.

D. Ciliated Epithelium

In structure, it is like columnar epithelium. In addition they contain at their five margins a number of fine protoplasmic projections called cilia. The wind pipe on trachea is internally lined by ciliated epithelium.



Ciliated Epithelium

Function

Remove the dust particles by the vibration of the cilia

E. Sensory Epithelium

Some of the epithelial cells are modified to respond to stimuli and they form sense organs.

Vascular Tissues

This is a liquid tissue adapted for the transportation of the nutritive materials, respiratory gases, excretory materials and others. It consists of 55% plasma and 45% blood cells. There are three kinds of blood cells.

Theyare

i) Red Blood Cells (Erythrocytes) : RBC

ii) White Blood Cells (Leucocytes) : WBC

iii) Blood Platelets (Thrombocytes).

i) Erythrocytes: The Red Blood Cells present in vast majority. Each red cell is a circular or biconcave disc

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without a nucleus. These are formed in the bone marrow. Life span is between 100 to 120 days. It contains haemoglobin, a respiratory pigment that chiefly carries oxygen from the lungs to the other parts of the body.

ii) Leucocytes: The nucleated white blood cells are irregular and contain no pigment. They are produced in the bone marrow and in the lymph glands. Life span of WBC is two or three weeks.

They are the police force of the body and protect it from the disease producing organisms.

iii) Thrombo cytes: The bloodplatelets are the smallest of the blood cells and responsible for the clotting of the blood when blood vessels are damaged.

Connective tissues

The cells of connective tissues are loosely spaced and embedded in an inter cellular matrix. The matrix may be jelly like fluid, dense or rigid. They are of two types. They are

A) Adipose tissue

B) Supportive tissue

A) Adipose Tissue:- This is modified for storing fat. The inter cellular material is more or less absent. It is found chiefly below the skin and in between the internal organs.

ACTIVITY 6.3

Observe the different types of epithelial tissue under microscope and identify their improtant features.

B) Supportive Tissue:- This tissue gives support to the entire body. The supportive tissues are of three types. They are

i) Cartilage Tissue

ii) Bone Tissue

iii) Areolar Tissue

i) Cartilage Tissue:- It has widely spaced cells. The solid matrix is composed of proteins and sugars. Cartilage smoothens bone surface at joints and is also present in the nose, ear, trachea and larynx

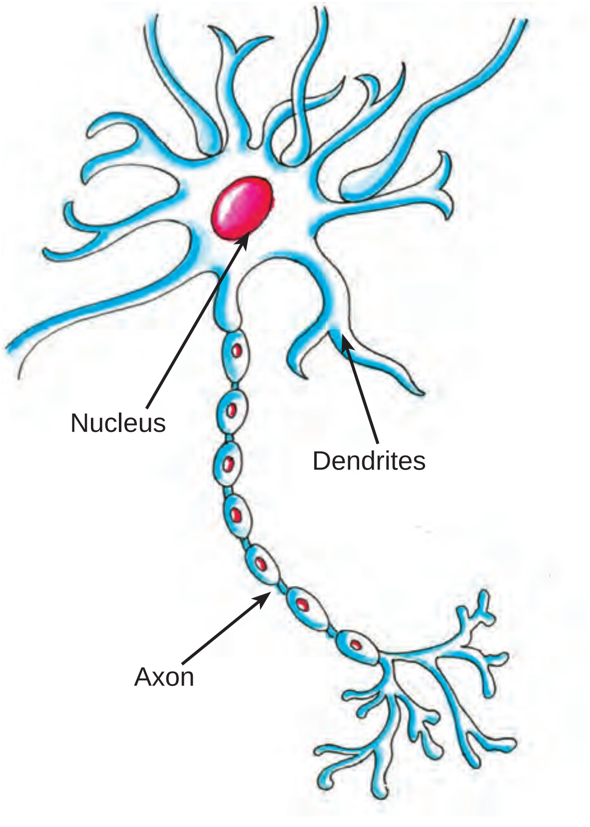
ii) Bone Tissue:- It forms the framework that supports the body. Bone cells are composed of Calcium and Phosphorus compounds. Two bones can be connected to each other by the ligament. This tissue is very elastic and ligaments contain very little matrix.

iii) Areolar Tissue:- It is found between the skin and the muscles around the blood vessels, nerves and in the bone marrow. It fills the space inside the organs. It supports the internal organs and helps in repairing the tissues.

Nervous Tissue

The nervous tissue is formed of nerve cells called neurons and nerve fibres. It has highly developed powers of irritability and conductivity.The brain, spinal cord and nerves are all composed of nervous tissue.

Neurons: It is a structural unit of the nervous system. It has a cell body



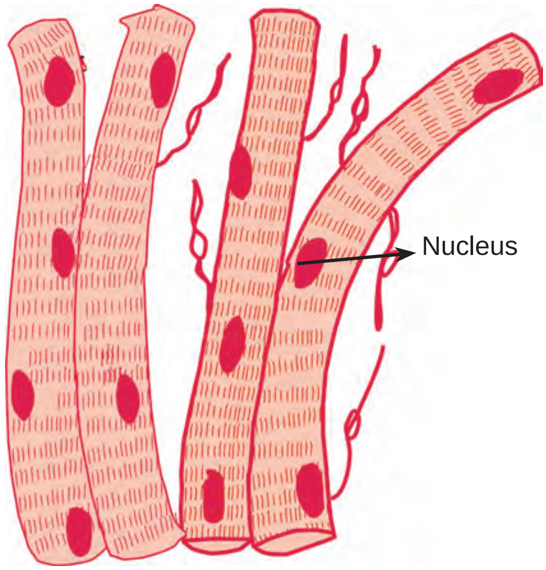
Neuron

called cyton which assumes different shapes in the different regions of the nervous system, and a long tail called axon. Neurons may be either rounded or oval shaped. The protoplasm of the cyton has a number of small dark granules referred to a **nissel bodies**.

The cyton gives out numerous branches called dendron. This, in turn, divides into finer branches called dendrites.

Muscular Tissues

It consists of elongated cells also called muscle fibres. This tissue is responsible for movement in our body. Muscular tissue contains proteins called **Contractile Proteins**. There are three types of muscular tissues.



Striated Muscle

a) Striated Muscle: Since these muscles are attached to the Skeleton, they are also called Skeletal Muscles. Each muscle fibre in this muscle is a long parallel sided, cylindrical structure with cross striations hence named striped muscles. It has number of nuclei placed also near the Periphery. They are covered by a membrane called sarcolemma. Since their contraction is under conscious control they are also called voluntary muscles.

b) Non-striated muscles

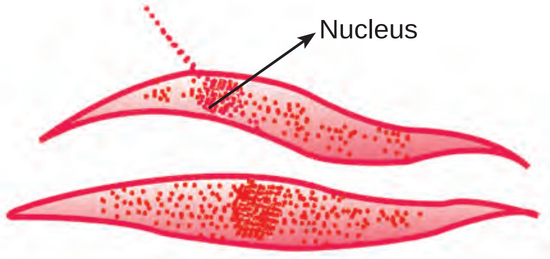
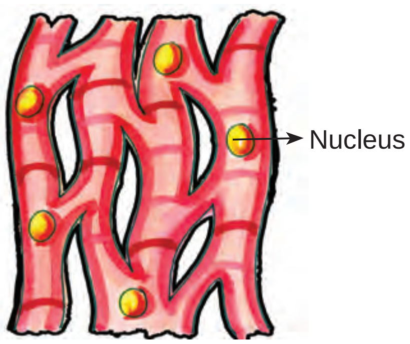


Diagram :Non-striated Muscles

The cells are arranged to form a sheet of muscular tissue commonly found in the wall of the digestive tract, urinary bladder and other internal organs. They are not under the control of our will power. So, they are called involuntary muscles.

c) Cardiac muscle: In structure, they are in between the striped and unstriped muscle fibres. These are found only in the heart.

They are multinucliated but the nuclei are centrally located. **Dark** and **Light** bonds are present. The muscle of the heart show rhythmic contraction and relaxation **throughout life**. These involuntary muscles are called cardiac muscles.



Cardiac Muscle

6.3.2. ORGANS

Two or more kinds of tissues is associated together to form an organ. An organ is a specialized part of the body performing some specific functions. For example, the eye, has epithelial tissue, connective tissue, nervous tissue and muscular tissue. We have so many such organs in our body like eye, ear, lungs, etc.,

Now let us study in details about the eyes.

The eyes (Photoreceptor)

The sense organ eye is concerned with vision. The eye which is spherical in shape is kept in the orbit of the skull.

The eye is made up of three coats.

1. The outer-sclerotic coat
2. The middle choroid coat
3. The inner coat (Retina)

1. Sclerotic coat

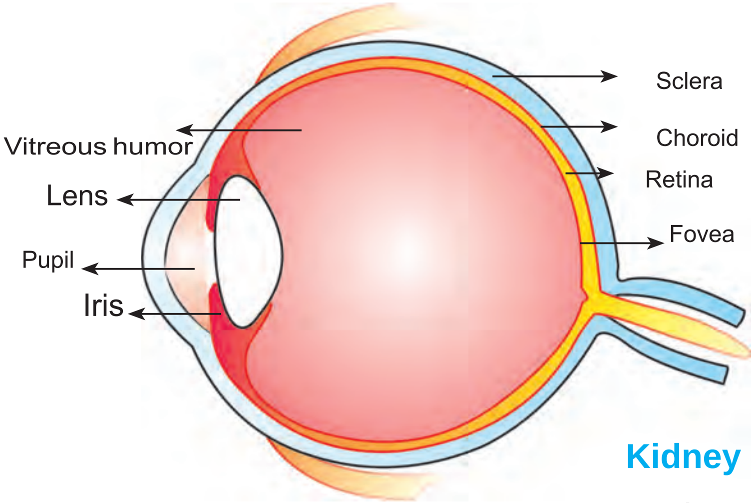
The outer sclerotic coat is white in colour except in the front where it forms the transparent cornea.

2. The middle choroid coat

It is highly vascularised and deeply pigmented. In front of the eye the choroid coat forms the iris and lens. An opening called the pupil. It is present in the centre of the Iris.

3.The inner coat (Retina)

Retina is the sensitive part of an eye. It contains two types of receptor



Cross-Section of the eye

cells the **rods and cones**. Rods are sensitive to different shades of light but not colour. Cones are sensitive to colour. The fovea or yellow spots of the retina are densely packed with cones. It is the part one uses when one concentrats on something. e.g. When reading, sewing. The lens is transparent , elastic and biconvex in shape. It is attached by ligaments to the ring shaped cillary muscles. The Aqueous humors is a clear, watery liquid between the cornea and the lens. The Vitreous humors is a viscous liquid which fill the space between the lens and the retina. Vitreous humors helps in image formation and also to maintain the spherical shape of the eye.

6.3.3. Organ Sytem

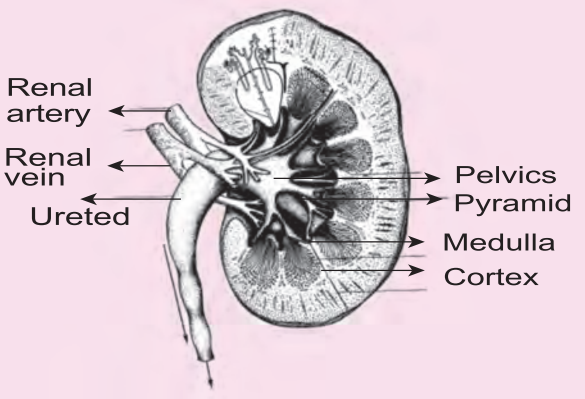
Several organs of a body together perform a common function. They constitute an organ system.Now let us discuss about the excretory system and their functions.

Excretory system

Excretion is the elimination of metabolic waste products from the body. The major function of the excretory system is the elemination of nitrogenous waste products from the body. The mammalian urinary system consists of two kidneys, ureter and urinary bladder.

Kidney

There is a pair of kidneys located inside the abdomen on either side of the vertebral column in the lumbar region and against the posterior abdominal wall. The right kidney is slightly on the lower side due to the presence of liver. The outer surface is **convex** and the inner surface is concave. The concave side is called **hilus**.



Vertical section of the kidney

A vertical section of the kidney shows an outer dark portion called the **cortex** and the inner pale region called medulla. The medulla has a number of cone like structures called **pyramids**. The pelvis projects in between the pyramids as cup like spaces called calyces.

BIOLOGY

Nephrons

Kidney contains many minute tubular nephrons.These are the structural and functional unit of the kidney.

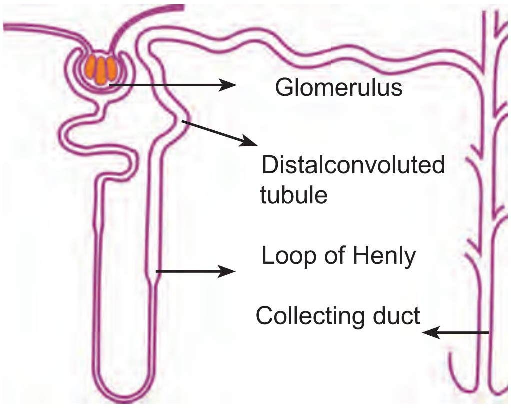


Diagram : Structure of nephron

Function of the Kidney

- The kidney not only removes the waste product from the blood but also maintains a constant composition of blood.
- It maintains the p^H
- The kidney regulates the loss of excess water from the body

6.4. HOMEOSTASIS

Homeostasis is the maintenance of a constant internal environment of the body. It was first pointed out by the French physiologist **Claude Bernard** in 1857. All mammals are capable of maintaining a constant body temperature despite changes in the external temperature. Behavioural and physiological responses are two important regulating mechanisms to maintain the stability of Homeostasis.

For example

The control of blood glucose level is a good example of homeostasis and involves the secretion of atleast six hormones. A rise in blood glucose level stimulates insulin secretion where as a fall in blood glucose level inhibits insulin secretion and stimulates the secretion of glucagon and other harmones which raise blood glucose levels.

6.5. CELLULAR RESPIRATION

Respiration is the process by which chemical energy in organic molecules is released by oxidation. This energy is then made availabe to living cells in the form of ATP

The biochemical process which occures within cells is called cell respiration. If it requires oxygen, it is described as **aerobic respiration**. If the process takes place in the absence of oxygen, it is described as **anaerobic respiration.**

Aerobic respiration

It involves the utilisation of free oxygen and results in complete oxidation to carbon-di-oxide and water.

Anaerobic Respiration or Fermentation

Here oxygen is not utilized for respiration. So, it is called anaerobic respiration. It is often referred to as fermentation.

A variety of micro organisms use anaerobic respiration as their major source of ATP. e.g., Bacteria, Yeast.

6.6. METABOLISM

The word **metabolism** has its root from the Greek word **Metabloe** which means **change.** The sum total of biochemical reactions involved in the release and utilization of energy or energy exchange within the organism is termed as metabolism.

Such a chemical reaction in the metabolic process can be divided into two categories.

1. Anabolism

The simple substances are obtained from the food are converted into cellular substance. This process is called Anabolism. During this process energy is not involved or utilized.

For example,

Glucose → Glycogen and other sugars

Amino acids → Enzymes, hormones, proteins

Fatty acids → Cholesterol and other steroids.

2. Catabolism

Organic substances which are obtained from the food are broken down to produce energy for the purpose of physiological functions of the cells. This process is called as **catabolism**.

The following are the example for catabolism

Glucose → CO_2 , Water and heat

Protein → amino acid

Fats → Glycerol, fatty acid, etc.,

The repeated anabolism and catabolism in the metabolic process maintains the homeostatic conditions of the body.

Because of the metabolic process, the ionic balance is being maintained in the body.

The metabolic process is responsible for movement, growth, development, maintenance and repair of the cell, tissue and body.

This metabolic process occurs in different organs of living species.

6.7. DESIGN OF THE BODY – THE BEAUTY OF STRUCTURE AND FUNCTION – SOME EXAMPLE.

Our body structure suits the function. The human foot, which was originally a climbing structure, has been readapted for bipedal walking and running.

Likewise there are so many animals from unicellular to multicellular whose body structures suit the function and their structure is suited for the movements they make.

Some animal movements are very beautiful. For example, an insect walking on the undersides of a leaf, soaring of eagles and the running of Jaguar and others are very puzzling.

Soaring of eagle

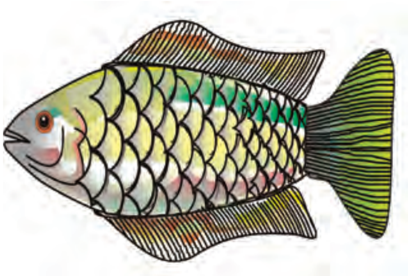
Let us see some in detail.

Body Contour

It is nothing but the shape of the body. See the race horse. Their body is beautifully designed by nature. The body is spindle shape, stream line contour offer minimum resistance in air.

Racehorse

In fish also, the body is streamlined. So it can freely swim in the water.



Fish - Rohu (Belongs to Kendai)

How do animals fly?

The nature of the flight of an Aeroplane differs from that of Birds, Animals, and insects. Plane have fixed wings that create lift when air flows past them, they move forward by pushing air very fast through a jet engine or around a propeller.

The wings of animals do both these jobs at once. When the wings flap downwards, the body of the bird or bat or insect is pushed forwards and it is kept aloft and stable in its flight.

Bat

Bats are the only mammals that truly fly, by flapping the wings. The wing of bat is a fold of skin of patagium supported by all digits of the hand except the first.

Now let us see the various shapes of beaks.

The following are some of the examples of beaks of birds. See how beautifully they are designed by nature to suit their mode of feeding habits.

Pelicans feed on fish, which they scoop up in the flexible pouch that lie under their long beaks.

Pelicans

When a bird eats insects, worms or berries, its bill or beak helps it get the food it wants. For most birds, its bill is a special tool that has the right shape. In fact, the bills of many birds work just like tools you may have at home.

Sparrow

A sparrow eats seeds it finds on the ground. Its bill makes them easy to pick up.

A heron also gets its food in the water. It spears fish ,lifts them out of water, and swallows them.

Heron

ACTIVITY 6.4

Make a list of desert plants and animals and write how their body strucure is adapted to suit their habitat.

EVALUATION

1. Match the following.

a) Endoplasmic Reticulum	__	sweat.
b) Glandular Epithelium	__	streamlined body.
c) Retina	__	porter.
d) Kidney	__	cone cells.
e) Fish	__	nephron.

2. Choose the correct answer.

1. Muscle fibres are branched in ________ (cardiac/ skeleta) muscle.
2. Bone and cartilage are type of ________ (nerves/ connective) tissues.
3. Ciliated epithelium is found in ________ (trachea / Oesophagus)

3. Choose the correct answer.

A. Assertion : The image falls on Foevea

B. Reasoning : Because of refraction of light by viteous humors

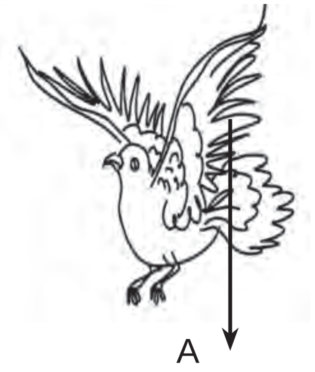
A is correct	B is wrong
B is correct	A is wrong
B explain	A
A explain	B.

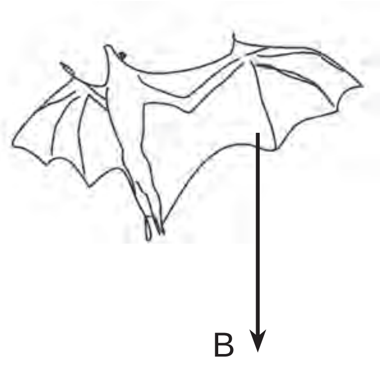
4. Complete the table by filling the functions.

Tissues	Functions
1) Columnar epithelium	
2) Glandular epithilum	
3) Ciliated epithilium	

5. i) Identify part A and part B

ii) How does part A differ from part B





6. Observe the following table.

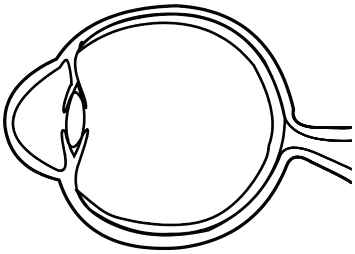
S.No	A	B	C
1.	Cristae, Matrics, Ribosome		
2.	Nerve, Muscle, Golgi apparatus		

In Column A, 3 terms are given of 2 belong to one group and 1 remains as odd. Identify the odd item and write it in Column B and write the common features of the other two in Column C.

7. Copy the diagram of human eye. Label the following parts:

a. The transparent part of the sclera.

b. The spot on the retina where cones are most abundant.



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CHAPTER 7

CONSERVATION OF PLANTS AND ANIMALS

7. CONSERVATION OF PLANTS AND ANIMALS

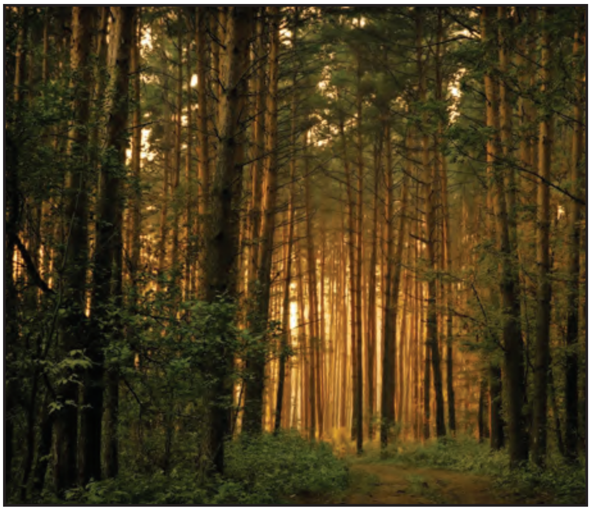
7.1. CONSERVATION OF FOREST AND WILD LIFE

Forest Ranger: Hello, Sheelan, good morning. Welcome to topslip, one of the forest areas in the state rich in biodiversity.

Sheelan : Thank you sir. I was told to meet you in the Annamalai Tiger Reserve.

Forest Ranger: I too was informed to share some interesting facts of forests and wildlife with you.

Sheelan: I will be very happy if I get more exciting information about forest and wildlife.



A forest

A herd of deer

Forest Ranger: "Trees, what do they mean to you?

Sheelan: Oh! Trees provide a number of economically valuable commodities, the most important being timber, fuel wood, and products such as bamboo, gums and leaves.

Forest Ranger: You know that they have the capacity to support many lives, like animals, birds, insects, fungi.

Sheelan: Sir, a slogan says that forests are signs of prosperity.

Forest Ranger: Forests provide our wealth and also they maintain our health. More important is the conservation of the already existing forest covering the Himalayas, Western and Eastern Ghats, setting

Conservation can be defined in simple terms, as the management of resources in such a manner that the benefits accuse to largest number of people for the longest possible time without harming the natural or ecological balance.

All non-domesticated and non cultivated biota found in the natural habitat are termed wild life.

more National parks and sanctuaries. Come let us go into the forests.

Need for Conservation

- Wildlife is an asset to be protected and preserved because of their aesthetic, ecological, educational, historical and scientific values.
- Wildlife is essential for ecological balance.
- Wildlife is a big boost to tourism.
- The innu merable plants could yield products of immense medicinal value.
- The wildlife is an important source of genetic material useful in genetic engineering

India being a subtropical country, the temperature in most parts of the country is conducive to plant growth. Based on this the forests can be divided into five major types.

Desert (Dry forests) - Rajasthan, Southern parts of Punjab & Haryana

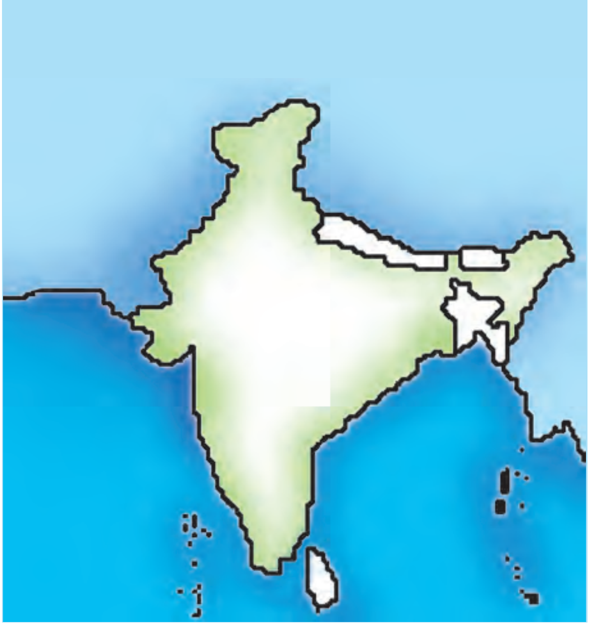
Deciduous forest - Peninsular region

Tropical Evergreen forests - Western Ghats, hilly areas in north eastern India, Sub Himalayan belt

Hill (mountain) forests - Himalayas, Southern India

Tidal forest - Estuaries of Ganges & Mahanadi

Plot or shade the different types of forests in india.



- DESERT VEGETATION
- TROPICAL DECIDUOUS FOREST
- TROPICAL EVERGREEN FOREST
- MOUNTAIN FOREST
- TIDAL FOREST

7.2. DEFORESTATION AND AFFORESTATION

Selfish and anti-social elements have perished the natural wealth. It is deforestation.

Reduced rainfall, change in climate, soil erosion, imbalance of green house, (global warming) are some of the ill-effects of deforestation.

If trees are planted newly, it is a process of afforestation. This is generally done in deserts and open grounds to check the wind velocity.

How do people involve themselves in planting new trees?

Afforestation has aimed at two kinds of forestry programmes such as **social forestry** and **agro forestry**. They can start a 'Tree lovers club' in their street, invite more people to join, plant tree saplings on their road side and can gift a tree sapling to their friends on their special day.

Social Forestry

In India Social forestry project was started in 1976. Its aim is to promote natural forests and create forests on unused lands. Social forestry also aims at raising plantations by the common man so as to meet the growing demand for timber, fuel wood, fodder etc., thereby reducing the pressure on the traditional forest area.

Agro Forestry

Planting of trees in and around agricultural boundaries and on marginal, private lands, in combination with agricultural crops is known as agro-forestry. The land can be used to raise agricultural crops and trees and rear animals.

MORE TO KNOW

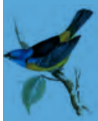
Cutting down forest increases the amount of carbon - di oxide in the atmosphere, which can affect climate and destroy the homes of many animals and plants. So deforestation leads to soil erosion, irregular rainfall and global warming.

7.3. FLORA AND FAUNA

India has a large variety of plants, about 45,000 species in number.Of these 15,000 are flowering plants; 1,676 are algae; 1,940 are lichens; 12,480 are fungi; 64 are gymnosperms;

AFFORESTATION

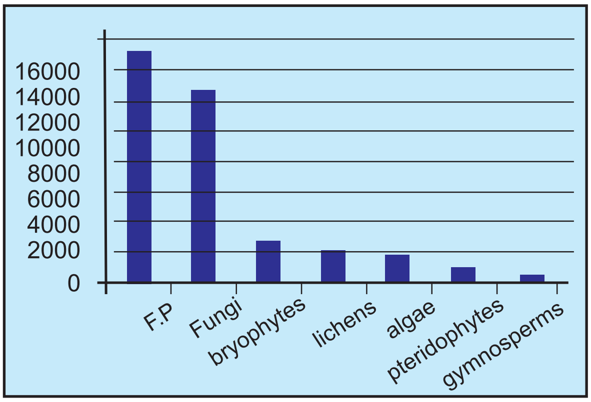
DEFORESTATION



Lion tailed monkey

2,843 are bryophytes; 1,012 are pteridophytes. India can be divided into eight distinct floristic regions.

India has a great variety of fauna numbering 81,251 species, which represent 6.67 % of world's fauna. Of these, about 60,000 are insects; about 5,000 are molluscs; about 372 are mammals; about 1,228 are birds; about 446 are reptiles; about 204 are amphibians; about 2, 546 are fishes. Zoological Survey of India (ZSI) is responsible for carrying out surveys of the faunal resources of the country.



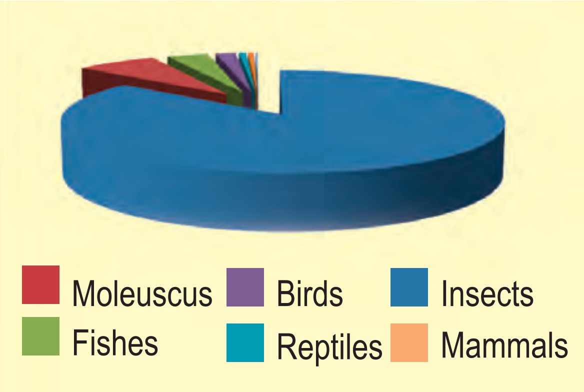
The natural vegetation (plants) in a particular area is termed as flora.

Deforestation refers to the indiscriminate cutting down of forest trees for use in wood-based industries (furniture making, paper, plywood) as domestic fuel, and to accommodate agriculture and industries. In many parts of our country the natural vegetations are destroyed illegally.

7.4. ENDANGERED SPECIES

Why did animals begin to live on land?

The very earliest creatures lived in water. Then plants began to grow on the land. These provided a new source of food and some animals left the water. They developed lungs



All the micro-organisms to macro-organisms (animals, birds, etc.) are termed as fauna.

instead of gills, for breathing. The first to come on land were the amphibians.

How did the dinosaurs disappear?

They are pre historic animals and are disappeared due to natural calamities. Their names are made up of Greek and Latin terms. The word dinosaur itself means 'terrible lizard'

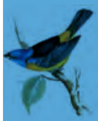
Today many species of animals are in danger of dying out. They include rhinos, whales, wolves, eagles and few rain forest birds. Some are being killed because humans want their skins, bones or the land they live on. Others are being poisoned by man made chemicals and other traps. Those days kings, high officials of royal britain hunted many wild animals. Today poachers are hunting the animals for their own benefits. Monal found in Himachal Pradesh is one of the most beautiful birds and it has been hunted to the level close to extinction. Species with low population numbers that are in considerable danger of becoming extinct is termed as **Endangered Species**.

There are many Projects which were proposed by the Government of India. Such as Project Tiger, Project Elephant, Operation Rhino, Gir Lion Project and a Crocodile Breeding Project.

"Project Tiger" The population of Tiger (*Panthera tigris*) reduced from about 40,000 at the turn of the century about 1827 in 1972. In 1, April 1973, Project Tiger was launched by Government of India, which resulted in increase population of tiger.

"Project Elephant" Elephant is the symbol of our National heritage animal. The population of Indian elephant Elephas maximus is threatened due to poaching for ivory and habitat

Due to deforestation and various causes, the populations of several species of plants and animals are at the verge of extinction and several are considered endangered



destruction. An ambitious programme "Project Elephant" was launched by Ministry of Environment and Forests, which will focus on solving the problems of humans and elephants competing for the same habitat.

"Operation Rhino" Number of Indian rhino or one horned Rhinoceros (*R.unicaris*) are lost due to hunting and flood. To protect the Indian species, centrally sponsored rehabilitation programme was undertaken in Dudhwa National Park.

"Lion sanctuary" In 1972, a five year plan was proposed by the Government of Gujarat to protect this magnificent feline species in the Gir Sanctuary. Its national park and ecological balance of the habitat is properly protected. This has resulted in increase in lion population.

Crocodile Breeding Project: Crocodile breeding and management project was launched by Government of India in 1975 for all the three endangered crocodile species namely, the fresh water crocodile (*Crocodylus palustris*), saltwater crocodile (*Cricidylus porosus*) and the rare gharial (*Cravialis gangeticus*)

7.5. RED DATA BOOK

It is a record book. International Union for Conservation of Nature and Natural Resources (IUCN) maintained the Red Data Book. Red Data Book contains a record of animals which are identified as endangered species or animals which are in the verge of extinction.

In India, animals like Indian one horned rhino, Nilgiri tahr, Lion tailed macaque, Asiatic Lion, Indian tiger, Olive Ridley turtle and birds like hornbill, monal, Great Indian bustard, and pheasant are on the verge of extinction.

MORE TO KNOW

NGC (National Green Corps) of the Ministry of Environment and Forests, Government of India.

National Animal - Tiger

National Bird - Peacock

National Flower - Lotus

National Fruit - Mango

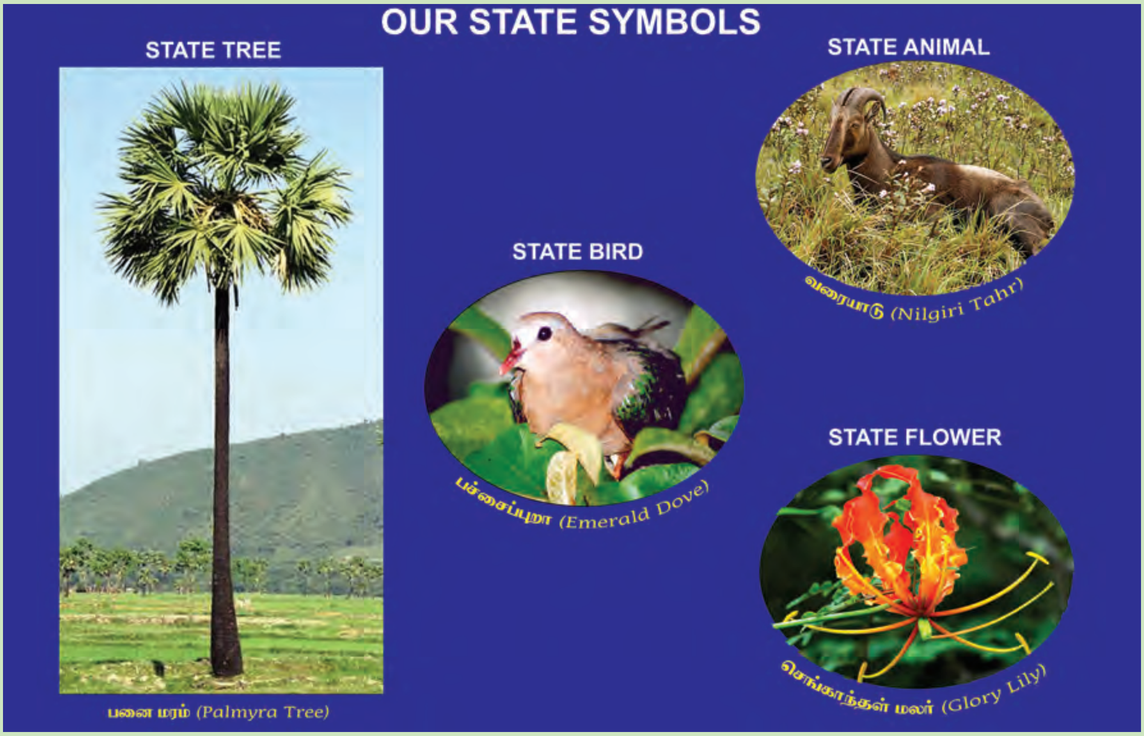
National Tree - Banyan tree

National heritage animal - Elephant

Lion, Tiger, Leopard, Snow leopard and Clouded leopard are in India. Cheetahs became extinct in 1950s.

The breeding area of the famous Olive Ridley's turtle is the Coast of Orissa while the Hawksbill Turtles breed on the Coast of Tamil Nadu.

MORE TO KNOW



7.6. MIGRATION

All animals have an instinctive perception of changes in temperature, and just as men seek or spend their summer in cool places and their winter in warm places, so also all animals that can do so shift their habit in various seasons

ARISTOTLE, 384 – 322 B.C, History of animals

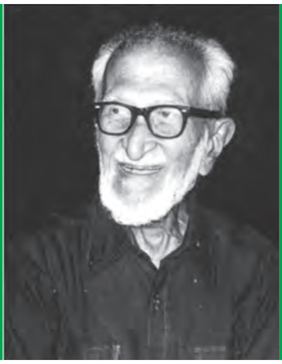
Aristotle recognized the seasonal movements of animals 2000 years ago. So migration is the phenomenon of movement of animals from its habitat to some other habitat for a particular time period every year for a specific function like safe breeding. Vedanthangal bird sanctuary is one of the most spectacular breeding grounds in India. This Sanctuary has been protected by the local people for well over 250 years. **Vedanthangal** is a home for migratory birds, such as pintail, garganey, grey wagtail, blue-winged tail, common sandpiper and some more.

Navigation Databanks of Migrating Birds

Each year as the days shorten and the food supply dwindles, many bird species prepare themselves for a long flight to warmer, move fruitful

Migration of birds

climates. Then one day driven by deep ancestral urges they set out for unknown destinations. The swallows of northern Europe, for example may fly 6800 miles (11,000 km) or so to their African wintering grounds. When they move in groups they are protected from their predators. Many birds that migrate may be sensitive to variations that occur in the earthen magnetic field. With the help of that they will find their destinations. Racing pigeons find their way home only by this method.



Dr. Salim Ali
(1896 – 1987)
Orinthologist,
known as
"the bird man
of India "

MORE TO KNOW

When a swarm of desert locust is on the move (A single swarm is about 50,000 million) eats 3000 tons of vegetation in one day.

- The salmon fish travel up to 1500 miles (2400 km) from the sea to fresh water for breeding. Most of them die after breeding due to exhaustion.
- The Brazilian turtles travel up to 1250 miles (2000 km) in eight weeks time for breeding
- Barren grounds Caribou of North America travel over 3700 miles (5000 km) the longest annual migration of any mammal

Migration of turtle

7.7. WILD LIFE SANCTUARY AND NATIOAL PARKS

Herd of elephants enter into the villages, why?

It is not the herd of wild elephants that entered into the village, or field etc. Humans have converted their habitat (territory) for their own commercial and productive use.

Government has taken many steps to protect the wild life by providing Sanctuaries and National Parks.

Sanctuaries : Sanctuaries are the places where the animals are well protected from any disturbance. Killing or capturing is highly prohibited. In our country there are about 500 sanctuaries. One of the most important missions of sanctuaries, beyond caring for the animals, is, educating the people. The individuals should be educated about the importance of animals so that the animals can be protected, and a good ecological balance can be maintained.

These losses have now reached critical levels and are beginning to be addressed as biodiversity loss. Loss of biodiversity occurs when either the habitat essential for the survival of a species is destroyed or particular species are destroyed. The former is more common. The later reason is encountered when particular species are exploited for economical gain or hunted for sports or food.

Peacock

The main objectives and advantages of biodiversity conservations are as follows:

- To preserve the continuity of food chain
- The genetic diversity of plants and animals is preserved
- It provides immediate benefits to the society such as recreation and tourism
- It ensures the sustainable utilization of life support systems on earth

Some important Sanctuaries in Tamilnadu

S.No	NAME OF THE SANCTUARY / LOCATION	ANIMALS
1.	Mundanthurai and Kalakkadu Sanctuary-Tirunelveli	Lion tailed monkey, Tiger
2.	Srivilliputtur sanctuary - Virudhunagar	Grizzled squirrel, barking deer
3.	Vedanthangal sanctuary - Kancheepuram	Cormorants, grey heron
4.	Mudumalai sanctuary - The Nilgiris	Elephants, gaur, langur
5.	Viralimalai sanctuary - Trichirappalli	Wild peacocks
6.	Kodiakkarai sanctuary - Nagapattinam	Chital, wild bear

NATIONAL PARKS: National Park is an area dedicated to protect the environment, the natural objects and the wild life there in. Many national parks were initially wild life sanctuaries. There are about 89 national parks in India.

Some important National Parks in India

Name and Location	Important Species
1. Bandipur national park, Mysore - Karnataka	Elephant, panther, barking deer, tiger, sambar.
2. Corbett national park, Garhwal - Uttarpradesh	Four horned antelope, elephant, chital, tiger, nilgai.
3. Gir national park, Junagarh - Gujarat	Asiatic lion, panther, nilgai wild boar, chinkara.
4. Kaziranga national park Jorhat - Assam	Elephant, one horned rhinoceros, wild buffalo, tiger, leopard.
5. Periyar sanctuary, Idukki - Kerala	Elephant, chital, nilgai, sambar, tiger, barking deer.

7.8. THREATS TO BIODIVERSITY

Current biodiversity is estimated at 10 to 100 million species, of which only 1.4 million have been formally catalogued. There are 12 mega diversity in the world. India is one of the 12 mega diversity centres of the world. Diversity among the living organism is known as Biodiversity. The biodiversity of the earth is unimaginable.

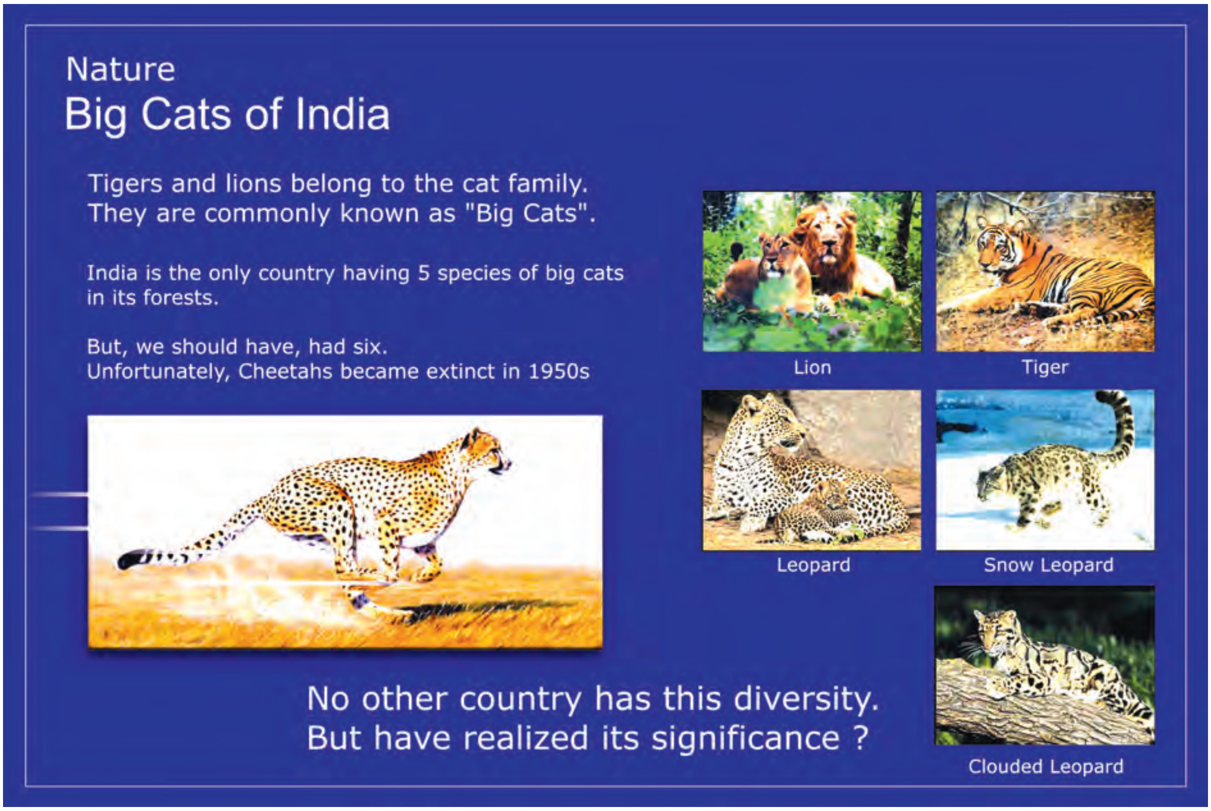
The natural causes for the loss of biodiversity are floods, earthquakes, landslides, natural competition between species, lack of pollination and diseases.

At the same time, man is the only cause for the loss of biodiversity. Destruction of habitats is the wake of developmental activities like housing, agriculture, construction of dams, reservoirs, roads, railway tracks etc.

Even the loss of a single species is a tragedy, because each form of life is a storehouse of irreplaceable genetic resources. Extinction is an irreversible process and when a species becomes extinct it sets off a cascade of extinctions.

All life on earth is interdependent and man is only a strand in this delicate web of relationships.

One day we are rapidly eliminating the conditions necessary for the continued existence of biodiversity due to over exploitation and ignorance.



7.9. TRADITIONAL KNOWLEDGE & PEOPLE'S INITIATIVES IN BIODIVERSITY

Sacred grove : These are the tracts of forests and are communally protected. As they have a temple or a deity pertaining to a particular forest, conservation of the sacred grove is high priority and the whole community is involved in it.Tradition of tree worship oriented to protection is observed all over India.

Worshipping the species vary according to community, region, as well as use value as per availability. Because of these traditions these species are protected. Traditional practices still followed by the tribals do not commercialize forest products and never exploit them in an unsustainable manner.

Traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural value beliefs, rituals including the development of plant species and animal breeds.

Sheelan: Thank you sir. You justified the facts and information. I gained a lot of knowledge and I promise to take this insight to my friends and others.

7.10. HUMAN WILD LIFE CONFLICTS

It is a well known fact that man has been the sole creature responsible for the destruction of large number of habitats, by over population, crowding, over exploitation etc. As human population is keeping on increasing, we move in to the forest land and occupy the habitats of plants and animals. So conflicts arise

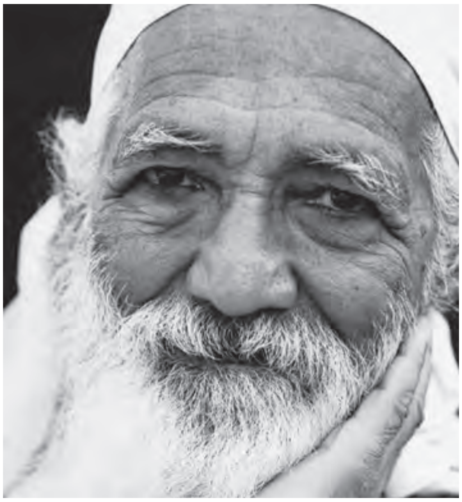
Sacred grove

between the animals and man. Animals like elephant, wild buffalo, and tiger come in groups to the farm lands for food and water and destroy them. But it is not the animals to be blamed; it is we the human beings have encroached their lands for our benefits.

Protecting the environment is every one's responsibility. There is an increased awareness among the people towards the conservation of ecologically sensitive areas. Green peace – a group devoted to environmental protection was responsible for helping to ban whaling. Closer home, the chipko movement initiated by Sunderlal Bahuguna stopped felling of trees in some parts of Himalayas.

Some of the activities in the areas of environmental conservation include:

- Holding rallies and marches to bring about a mass awakening to environmental issues
- Spreading awareness through mass media
- Introducing environmental legislation to tackle the issue



Sunderlal Bahuguna

Gaur (bison)

Bear

ACTIVITY 7.1

1. List the factories disturbing the biodiversity of your area. Some of these factories and human activities may disturb the biodiversity unknowingly. List these human activities. How can these be checked?

2. Find out the endemic (confined to your area alone) plants and animals of the region where you live, and also specify how many varieties are very rare.

EVALUATION

1.Choose the best answer

a) Species with low population numbers that are in considerable danger of elimination is termed as ——————(endangered species / extinct)

b) All non-domesticated and non-cultivated plants in the natural environ ment are termed as————————(wild life / ordinary life)

c) The natural vegetation in a particular area is termed as—————— (flora / forest)

d) All the micro-organisms to macro-organisms are termed as—————— (fauna / protozoans)

e) The word dinosaur itself means————————(terrible lizard / dragon lizard)

2. In India, social forestry was started in 1976. Its aim is to promote natural forests and create man made forests on unused lands. Suggest some steps to convert a sterile land into a cultivable one.

3. Wildlife is essential for ecological balance and a big attraction to tourism. Support the statement with your suggestions.

4. People tried several methods to keep wild animals away from the fields and villages. Power fences were erected around the fields against animals. Is it a healthy practice? Do you have any alternative plan to help them both?

5. Planting trees is known as afforestation, cutting the trees is deforestation. Is there is any permanent solution to the deforestation problem?

6. Deforestation leads to many changes in the following but they are jumbled. Arrange them in an orderly manner.

a) Earth b) cities (urban area) c) environment d) wild animals
e) villages f) rural areas g) the next generation

7. What will happen if

a. We go on cutting the trees.

b. The habitat of an animal is disturbed.

c. The top layer of the soil is exposed.

8. Indiscriminate cutting of trees will lead to deforestation. How does it reduce rainfall and also lead to flood on the other?

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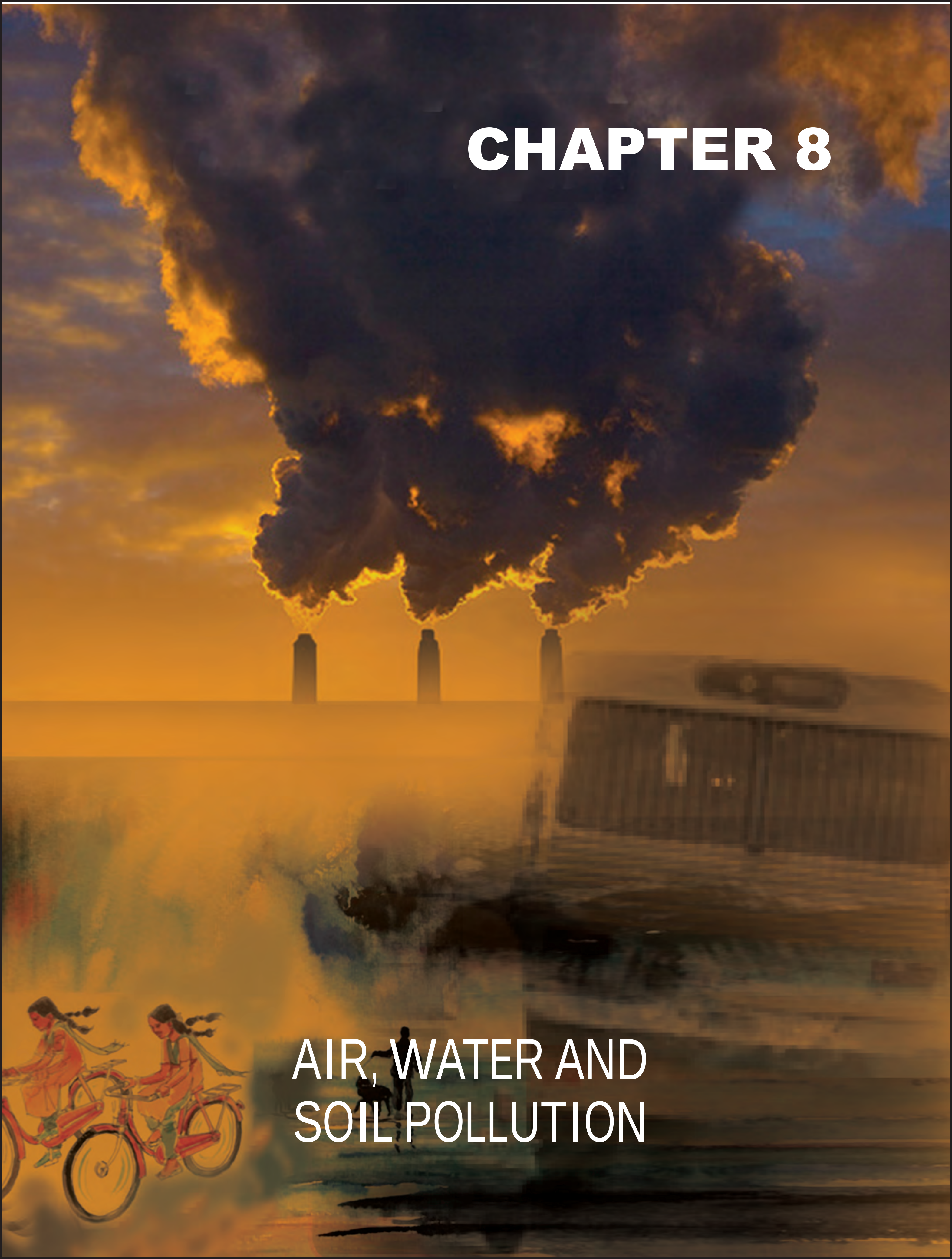


CHAPTER 8

AIR, WATER AND SOIL POLLUTION

8. AIR, WATER AND SOIL POLLUTION

Air, water and land are the most important natural resources. Human beings are responsible for changing the environment to fulfill their needs of food, clothing, housing, transport and industry. Human beings damage healthy environment by uncontrolled activities. Most of the environmental problems are related to the increasing population development in agriculture, transport and industry.

8.1. AIR POLLUTION

Air pollution is described as any change in the composition of air either by physical or chemical methods so as to cause harmful effects on health.

8.1.1. Sources of Air Pollution

There are namely two sources.

1. Natural sources
2. Man-made(anthropogenic) sources.

Natural sources

Volcanic eruption, forest fire, sea salt sprays, biological decay, photochemical oxidation of terpenes, marshes, pollengrains, spores, etc., Radio active minerals present in the earth's crust are the sources of radioactivity in the atmosphere.

Man made sources

Industrial emissions, vehicles, aeroplanes, power stations and burning of fuels, etc.,

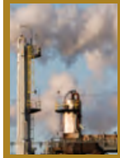
Mainly air pollution is caused due to burning of fuels to run vehicles, and from chimneys of factories and power stations.

Air contains 20.9% Oxygen, 78% Nitrogen, 0.03% Carbon Dioxide, Neon, Krypton, Hydrogen and water vapour in small quantities.

Vehicles cause 50% of the air pollution in India.

The Green House Effect

Some of the infrared radiation from the earth passes through the atmosphere but most is absorbed and re-emitted in all directions by greenhouse gas molecules and clouds. This warms up the Earth's surface and the lower atmosphere.



Air pollutants

The following table shows a few air pollutants and their effects on human being.

S.NO	NAME OF THE AIR POLLUTANTS	SOURCES	EFFECTS
1.	Carbon monoxide	Combustion of fuels	It reacts with haemoglobin in human blood forming carboxy-haemoglobin. It may lead to death.
2.	Carbon-di-oxide	Burning of coal/ timber	It leads to global warming.
3.	Nitrogen oxides	Automobile exhausts	It causes acid rain.
4.	Sulphur dioxide	Burning of sulphur	It causes eye irritation, lung cancer and asthma.

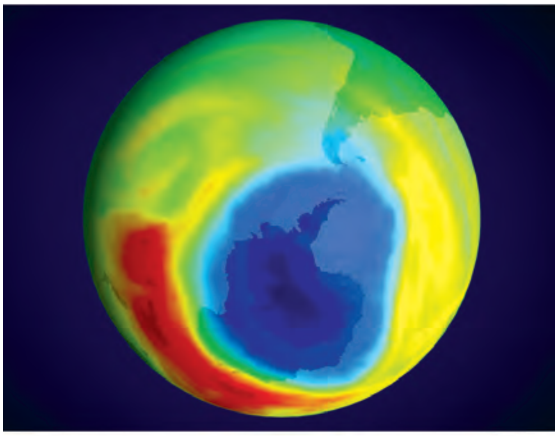
Acid Rain

Oxides of nitrogen, sulphur, carbon produced by combustion of coal, petroleum, etc,. dissolve in atmospheric water vapour. They form their corresponding acids like nitric acid, sulphuric acid, etc., and reach the earth's surface as acid rain.

Effects of acid rain

- It irritates eyes and skin of human beings.
- It inhibits germination and growth of seedlings.
- It changes the fertility of the soil, destroys plants and aquatic life.
- It causes corrosion of many buildings, bridges, etc.,

The increase in the concentration of green house gases (CO_2, methane) in the atmosphere allows radiations of short wavelength are reflected back to earth. The consequent increase in the global mean temperature due to green house gases is called global warming.



Ozone hole

Ozone depletion

Ozone is a colourless gas, found in the upper atmosphere (stratosphere) and is highly beneficial. Ozone layer is thinning due to the emission of pollutant into the atmosphere. Holes caused in the ozone layer allow the harmful UV rays to reach the earth.

Control of air pollution

Air pollution can be minimized by the following methods:

Use of crude oil should be avoided and use of high quality fuels, unleaded petrol, bio-diesel and compressed natural gas (CNG) should be recommended.

Use of automobiles should be minimized.

Industrial smokes must be filtered before releasing into the atmosphere.

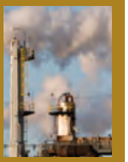
By planting more trees to get pure air (O_2) and reduce the CO_2 content of the environment.

8.2. WATER POLLUTION

Water is said to be polluted when there are undesirable changes in the physical, chemical and biological conditions of water that make it unfit for human consumption.

Water becomes polluted in many ways:

- Stagnant water becomes polluted day by day. It gives out a foul smell, mosquitoes breed there in large numbers causing malaria.



- Pond water may become polluted due to bathing and washing clothes. We should not wash our clothes at the ponds.

8.2.1. Sources of water pollution

Water pollution reduces the amount of pure fresh water that is available for agriculture, drinking, cleaning, swimming and fishing. The pollutants that affect water come mainly from industries, farms and sewage systems. Industries dump huge amounts of waste products into water bodies each year. Wastes from farms include animal waste, fertilizers and pesticides. Most of these materials drain off from fields into nearby water bodies. Sewage systems carry waste from homes, offices and industry into water.

The addition of hot water to water bodies also upsets the natural cycle. This is called thermal pollution. Hot water can kill animals and plants that can live only at lower temperature; it also reduces the amount of dissolved oxygen in water. Most heated water comes from industries and power plants that use water for their cooling towers.

Control and preventive measures

- Treating waste in effluent treatment plant before it is discharged into the water bodies.
- Reusing the treated water wherever possible either for gardening or cooling purpose.
  Over usage of water should be prevented.

Wash clothes at a place away from the well.

Water pollution

8.3. PURIFICATION OF WATER

Cleaning of water is a process of removing pollutants before it enters a water body. This process of waste water treatment is commonly known as Sewage Treatment.

What is sewage?

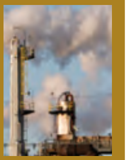
Sewage is waste water released by homes, industries, hospitals, offices and other users. It also includes rain water that has run down the streets during a storm or heavy rain.

Waste Water Treatment Plant

Treatment of waste water involves physical, chemical and biological process.

1. At first waste water is passed through bar screens.
2. Large objects like sticks, cans and plastic packets are removed
3. The water is then passed through a grit chamber in which sand is removed.
4. The water is then allowed to settle in a large tank.
5. Solid materials like settle at the bottom.
6. Then the water is transfered to the next tank having a skimmer. Thus skimmer removes the floating solids like oil and grease.
7. Next air is pumped through water in an aeration tank to help aerobic bacteria to grow. The bacteria consumes unwanted matters that are still remaining in water.
8. The treated water has a very low level of organic material and suspended matter. It is discharged into a rvier.

Waste water treatment plant



8.4. LAND POLLUTION

Pollution of the earth's natural land surface by industrial, commercial, domestic and agricultural activities is called land pollution. Throwing waste things like plastics, animal wastage, dye effluent, and agricultuaral wastage causes land pollution.

8.5. SOURCES OF LAND POLLUTION

Land is polluted by excessive usage of fertilisers, pesticides, sewage wastes and factory wastes. It is mainly polluted by garbage.

Some land pollutants called hazardous wastes cannot be disposed easily. Chemicals used in dry cleaning are examples of such wastes Proper disposal of hazardous wastes is vital to maintain a safe and healthy environment.

The use of excessive amounts of fertilizer may decrease the productivity of the soil. Pesticides destroy the insects that harm crops. But pesticides may also destroy other helpful organism in the soil.

Much damage to soil results from erosion. Erosion is the withering away of soil. It can result from removal of trees and other plants that hold soil in place. Wind can then easily blow the soil away and rain can wash it away. Careless farming methods, clearing of land for construction projects such as road and real estate development also cause pollution.

8.6. SCIENCE TODAY- BIOPOL.

The trade name of the fully biodegradable plastic material naturally produced by the micro organism is Alcaligens. This plastic is homo polymer i.e. Poly Hydroxy Butyrate (PHB).

Bioplastics are a form of plastic derived from renewable biomass sources such as vegetable oils corn starch, pea starch by the action of micro organisms.

The Eumycetes and Schizomycetes micro organism are responsible for degradation.

Bio plastics are bio degradable bio compatiable and renewable.

Uses of bio plastics

Bio plastics are used in many ways such as packaging, agriculture, and medicine.

Packaging : Trays and containers for fruits, eggs, meat and bottles for soft drinks.

Agriculture : Plant pots used for flowering and vegetable plants.

Medicine : To produce artificial heart valves tooth reconstruction, bone fracture plates and artificial skin.

BIOLOGY

ACTIVITY 8.1

Making of Bioplastic:

Materials Required:

1. Corn starch powder, 2. Glycerine

3. Vinegar, 4. Water

Method : Take a non stick vessel. Take one tablespoon of corn starch powder and four tablespoon of water. Stir it with a spatula and then add one teaspoon of Glycerine and one teaspoon of Vinegar. Mix them throughly and heat it slowly on a stove.

At first a paste like substance is formed and then it becomes a jelly like substance. When it becomes bubbleless and clear, stop heating. Pour it into a hard plastic tray and spread it. It will take about a day to dry. Now we can get bioplastic.

DO YOU KNOW?

Water watch

Is there any water bodies near your home or your school? It could be a small pond, or stream, lake, a river, or even the ocean. Take a closer look at it. Always take the **help of your parents or teachers.**

Is there anything unwanted floating on the surface? How dirty are the banks? Are there any sewage pipes leading into the water? Do people dump garbage around the water? Do they bathe or wash cloths there? Or do they bathe their cattle? Or wash trucks or tractors? Are there fields or factories around the water?

Pollution Patrol

What can oil in the water do to a bird? Try this, to find out.Take the feather of a bird. Feel it. Look at it.

Examine it with a hand or magnifying glass. Sketch what you see. Now dip the feather into water for a couple minutes. Take it out. Feel it, look at it and examine it with a hand lens. Note down your observations.

Then add some cooking oil to the water. Dip the feather again in the oily water. Take it out and once again feel and examine it. Does it feel and look difference? How would a bird with oily feathers be affected?

Polluting the planet

1. Over a million tons of oil are deliberately discharged into the world's oceans each year by tankers carrying out routine cleaning of their tanks.
2. Fertilizers make crops grow more quickly, but can also poison rivers and streams.
3. A sea bird covered in oil is obviously in great distress, because oil destroys the waxy covering of its feathers, causing it to become water logged and often to drown or die of cold.
4. Gases like sulphur di oxide released from power stations and factories kill many species of lichens and mosses.
5. Pesticides are causing birds to lay eggs with unnaturally thin shells
6. Today, literally tens of thousands of pollutants are present in air, water and soil and are incorporated into plant and animal tissues.

Air pollution

7. Pollutions is no longer a local or even a national phenomenon. It is a global problem.
8. The release of chloro fluro carbon(CFC) from refrigerators has caused a breakdown in the ozone layer. It causes skin cancer.
9. Coral reefs are damaged.

ACTIVITY 8.2

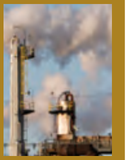
Find with the help of your teacher and the internet whether there are any international agreement to control global warming.

At an individual level, how can you help reduce air pollution?

1. You are a member of the municipal body of your town.
2. Make a list of measures that would help your town to ensure the supply of clean water to all its residents.
3. Prepare a brief speech on global warming. You have to deliver the speech in your class.

ACTIVITY 8.3

- Take up one case study on air pollution or soil pollution of your area and prepare a report on your findings.
- Design a comprehensive and colourful poster on the need to control water pollution or air pollution.



BIOLOGY

ACTIVITY 8.4

You may have covered your nose while passing a brick kiln or factory emitting smoke or started coughing while walking on a busy road. Compare the quality of air at the places given below.

- A park and a busy road.
- A residential area and an industrial area.
- A village and a town

Water (Prevention and control of pollution) Act 1974.

Air (Prevention and control of pollution) Act 1981.

Environment (Protection) Act 1986.

MORE TO KNOW

It has been suggested that we should plant eucalyptus trees all along the sewage ponds. These trees absorb all surplus waste water rapidly and release pure water wapour into the atmosphere.

Solution

Small contributions on our part can make a huge difference in the state of the environment. Always remember these three points and follow it in your day-to-day life. Reduce, reuse and recycle.

Environment provides a very close association and high degree of inter

dependence between the living and non living components of the earth. Among all the non living components water is an essential factor. The world is heading towards a water crisis due to natural and man made hazards. To save our earth we have to plant more trees and protect it. If we plant more trees it increases the rain fall and provide us a good climate to live.The oxygen content also increases, it may save our children from major effects of pollution.

"Save trees - Save life"

EVALUATION

1. You are supposed to leave a good environment for your future generation. In that case, which one of the following is a good fuel you use at present as far as cooking process is concerned.

   [Wood, Cowdung, LPG, Kerosene, Gobar-gas]

2. Think the ways in which you can use each of these things.

   A used paper envelope

   A used greeting card

   An empty ghee tin.

3. Rita and Aruna went out to eat ice cream. Afterwards Rita took the empty paper-cup home with her, to throw it away in the dust bin. Aruna threw her cup away on the road-side. If you were in this place, what would you do? Why?

4. A group of children went to a park for a picnic. When they went home, they left behind these things empty tins and bottles, wasted scraps of food, used paper plates and napkins. Which of these things will decompose and become part of the soil. What will happen to the other things. Can you suggest what the children might have done with these things.

5. Ramu collects pages from old calendars. He has noticed that they were blank on one side. Why does he do this? What do you think he could use these pages for?

STATE REASONS FOR THE FOLLOWING:

1. Trees growing near a factory often have a lot of dust on their leaves.
2. If too many trees are cut down on a hill side, there is danger of more soil erosion on the hill.
3. It is dangerous to throw harmful chemical substances into rivers.

FURTHER REFERENCE

Books

World science- Bay books   Pollution - Macmillan

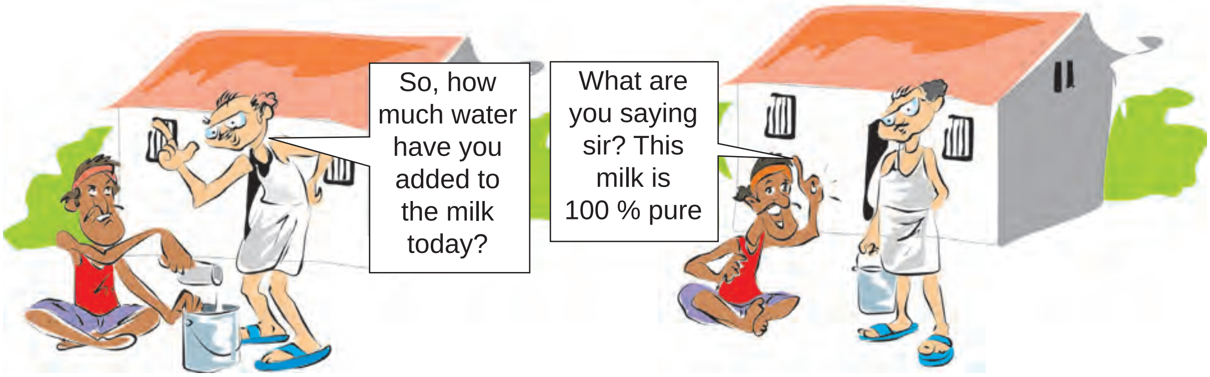
Website

www. kidsforsavingearth.org, www. tiki.oneworld.net

CHAPTER 9

ELEMENTS AND COMPOUNDS AROUND US

9. ELEMENTS AND COMPOUNDS AROUND US



9.1. TYPES OF PURE SUBSTANCE

Read the above conversation. How often do we use words such as 'pure milk' and 'pure water'? Have you ever wondered what 'pure' really means?

For an ordinary person, "a pure substance" means that it is free from adulteration. In that sense, the air we breathe and the milk we drink are not pure. However, there are a few cases where the matter that we encounterinordinaryexperienceis'pure' that is, they consists of only a single substance. Distilled water, sugar, baking soda etc. are pure substances like the copper used in electric wiring.

MORE TO KNOW

Air we breathe is not a pure substance but a mixture of gases

Milk is a mixture that contains liquid fat, protein and water.

How to recognise a pure substance?

One can recognise a pure substance by its properties such as density, melting point, refractive index, electrical conductivity and viscosity. Then, how can we define a pure substance?

A pure substance has fixed composition and fixed properties which cannot be easily separated by physical methods.

For example, pure water boils at 100°C at one atmospheric pressure and ice melts at 0°C. These are the properties of all samples of pure water, regardless of their origin. Pure water contains only two hydrogen and a oxygen which cannot be separated by physical methods.

In science, a pure substance is either an element (e.g., iron) or a compound (e.g., NaCl).

CHEMISTRY

ACTIVITY 9.1

List any 5 substances you consider pure:

1. -----------
2. -----------
3. -----------
4. -----------
5. ------------

9.2. WHAT IS AN ELEMENT?

The unscrambled words such as iron, copper, gold, oxygen and carbon that we come across in our daily life are said to be elements.

ACTIVITY 9.2

You have to unscramble the following words given in bracket:

1. Water conveying pipes are made of-------- (ONIR)
2. Electric wire contains ------- (PPERCO)
3. Ornaments are made of ---------- ------------ (LDGO)
4. The air we breathe consist of ------(YGENOX)
5. Coal contains------------------ (RBONCA)

Fig: 1

Fig: 2

Look at the pictures. What do you notice? Did you notice this. In fig 1, a boy is alone and in fig 2 two boys seem to be similar in all aspects (like twins)? Hence for analogy, we can say that both are elements.

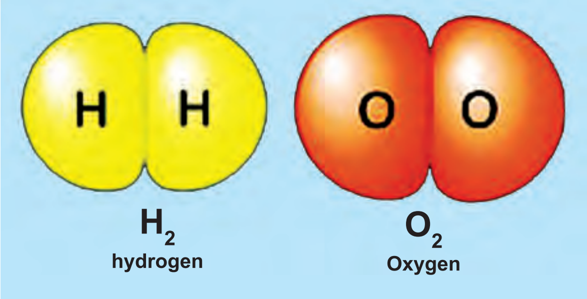
Let us see the different views of an element put forth by scientists

- An element is a pure substance that cannot be split into anything simple by physical or chemical methods. (BOYLE)
- An element is the basic form of matter that cannot be broken into a simpler substance. (LAVOISIER)
- An element is made of same kind of atoms. (Modern atomic theory)

MORE TO KNOW

An atom is the smallest particle of an element.

A molecule is made of the same kind of atoms or different kinds of atoms



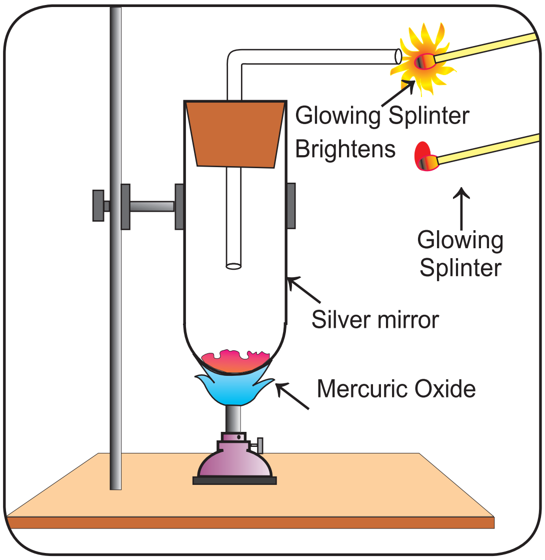
Examples of elements are hydrogen, nitrogen, oxygen, carbon, aluminium, gold, silver etc. A lump of sulphur contains sulphur atoms only. Nitrogen contains atoms of nitrogen only. Copper wires contain only copper atoms.

Thus,all elements are made up of one kind of atom only. However, atoms of different elements are not identical. For example, if we compare atoms of copper and silver, we find that they differ from each other in size and internal structure.

ACTIVITY 9.3

Take a little amount of mercuric oxide in a test tube. Heat it first gently, and then strongly in a bunsen flame. Observe the test tube. You will notice a silver mirror gradually appearing on upper part of the test tube and later, globules of mercury will be seen. Insert a glowing splinter into the test tube. The flame of splinter brightens showing the presence of oxygen. What does this tell you?

A complex substance like mercuric oxide is broken down into



simpler substances, Mercury and Oxygen. It is not possible to spilt these substances any further by any other chemical method. Thus, mercury and oxygen are elements.

Mercuric oxide → Mercury + oxygen
(element) (element)

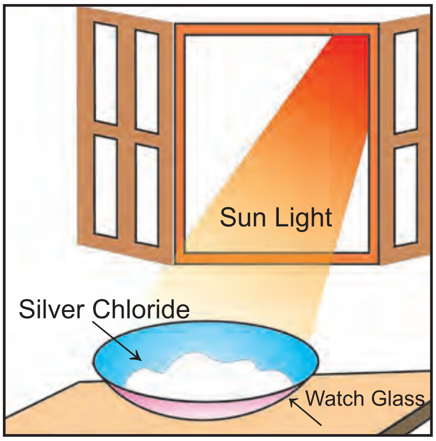
ACTIVITY 9.4

Take a small amount of crystals of silver chloride which are white in colour on a watch glass. Place the watch glass under sunlight for some time. What do you notice?

The crystal will slowly acquire grey colour. On analysis, it is found that sunlight has decomposed silver chloride into silver and chlorine(element)

Silverchloride (white) $\xrightarrow{\text{Sunlight}}$ Silver (grey) (element) + Chlorine Yellow green (element)

CHEMISTRY



you can repeat the same activity with silver bromide.

Silver bromide $\xrightarrow{\text{Sunlight}}$ silver + bromine
(light yellow) (grey)

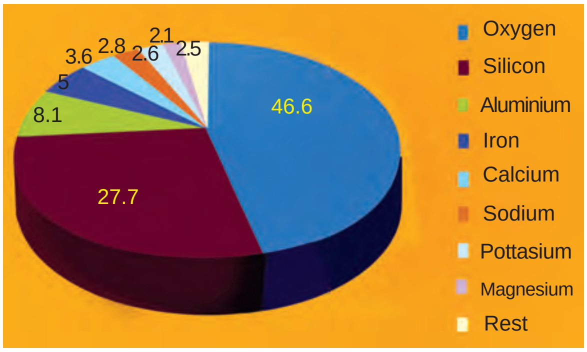
(element)(element)

9.2.1. Do you know how many elements exist in nature?

There are **118** elements known at present, out of which **92** elements occur in nature and the remaining **26** have been prepared in laboratory by artificial methods. However, only 112 elements have been authenticated by IUPAC (International Union of Pure and Applied Chemistry), and are allotted symbols.

Let us see the relative abundance of various elements in earth's crust, either in free state or in the combined state.

In earth's crust, oxygen is the most abundant element followed by silicon. Together, these make up three quarters of the earth's crust.



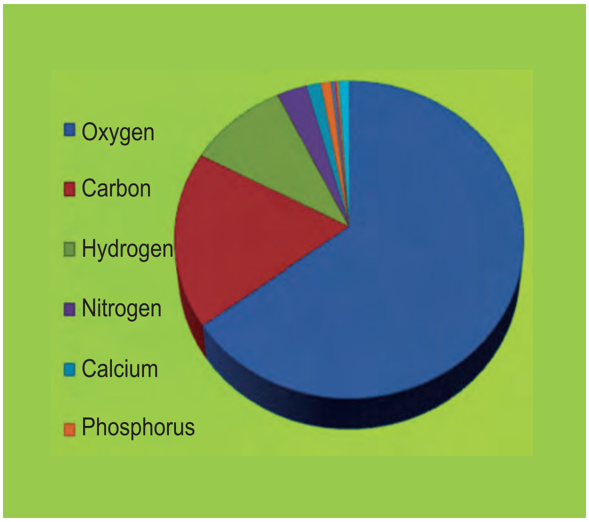
Pie Diagram - Elements present in the earth's crust

ACTIVITY 9.5

Can you find the most abundant element from the above pie diagram?

9.2.2. Have you ever thought about the elements found in our body?

About 99% of the mass of human body is made up of six elements (oxygen, carbon , hydrogen, nitrogen, calcium and phosphorus) and the rest 1% by other elements.



Pie Diagram - Elements present in the human body

All the living things, both plants and animals, are made from a few elements only. They are,

Oxygen (65%), Carbon (18%), Hydrogen (10%), Nitrogen (3%), Calcium (2%) along with some other elements.

Hydrogen and helium are the main elements in the universe and stars.

9.2.3. Classification of elements based on state

Let us classify the known elements on the basis of their state of subdivision as solids, liquids and gases.

Liquids: Mercury, bromine, (at room temperature) cesium and gallium can exist in liquids around 30° C.

Gases: Hydrogen, nitrogen, oxygen, chlorine, fluorine, helium, neon, argon, krypton, radon and xenon.

Solids: Remaining elements are solids. e.g., Carbon, silicon, copper, gold etc.,

9.2.4. Classification of elements based on properties

Now we classify the known elements on the basis of their properties as ***metals, non-metals*** *and* ***metalloids.***

Metals: Of the 92 natural elements 70 elements are metals. Metals are hard lustrous (shining in appearance), malleable(can be beaten into very thin sheet) ductile(drawn into wire), good conductors of heat and electricity, and sonorous (producing sound)

e.g., Copper, gold silver, iron etc,.

Non-metals: Only about 16-17 elements are soft, not lustrous, non-malleable, non-ductile, bad conductors of heat and electricity, and non-sonorous.

e.g., Hydrogen, oxygen,
sulphur, carbon etc,.

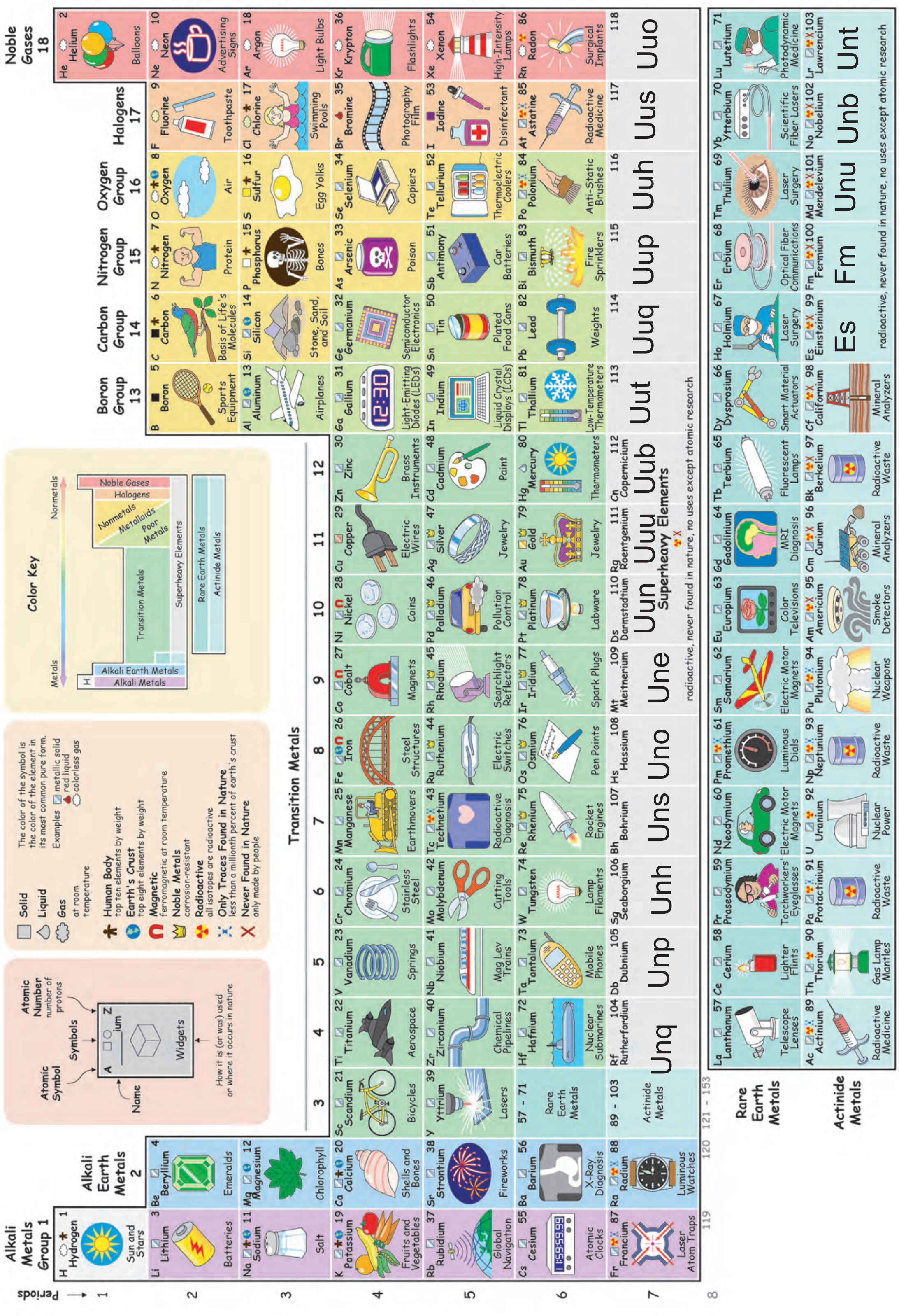
Metalloids: Very few semi-metals are known as metalloids which shows properties of metals as well as non metals.

e.g., Boron, silicon, germanium etc,.

MORE TO KNOW

- 20 % of the Earth's oxygen produced by the Amazon forest.
- An ounce of gold can be stretched into a wire of 80 kms (50 miles) long.
- The amount of carbon in the human body is enough to fill 9000 'lead' pencils.
- The noble gas xenon lasers can cut through materials that even diamond tipped blades will not cut.
- An average adult body contains 250g of salt .
- The metal with the highest melting point is tungsten 3410° C.

How elements are used in day- to- day life - Periodic table



ACTIVITY 9.6

Learn about uses of gases with the help of the periodic table:

Fill the blanks:

1. The gas that can be used to fill party balloons is _______.
2. The gas that is used to make flash light is _______ .
3. The gas widely used in advertisement signs is _______.
4. The gas present in tungsten bulb is _______.
5. The gas present in the universe is _______.
6. The gas used in high intensity lamp is _______.
7. The gas which is used in tooth pastes to keep the teeth strong is _______.
8. The gas which helps to keep swimming pool clean is _______.
9. The radioactive gas is _______
10. About 21% of earth's atmosphere consists of_______.

9.3. WHY SYMBOLS?

Every chemical change can be conveniently represented in the form of chemical equation. This is because describing a chemical change with the names of substances becomes difficult. So, we need symbol for an element.

What is symbol?

You are familiar with the use of shortened forms of names of people, countries etc. we refer to United Kingdom as U.K., United States of America as U.S.A. and so on. It is more convenient to use the shortened forms instead of writing down long names. Similarly, in chemistry, symbols are used to represent names of elements.

A symbol is a shortened form of the name of an element.

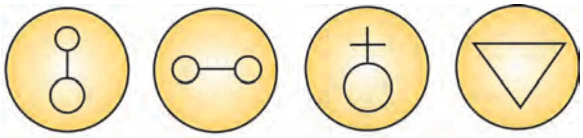
Let us learn the brief history of symbols of elements.

Greek symbols

Some earliest symbols in form of geometrical shapes were those used by the ancient Greeks to represent the four elements earth, air, fire and water.

Alchemist symbols

In the days of alchemists,the different materials that they used were represented by pictorial symbols.

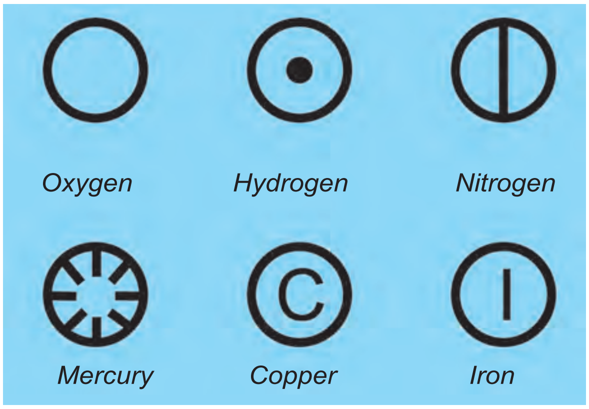


Nickel *Arsenic* *Antimony* *Water*

The work of trying to change less valuable metal into gold was called **alchemy,** and the men who did this work were **alchemists.**

Dalton's symbol

In 1808, **John Dalton**, a scientist, tried to name the various elements based on these pictorial symbols.



The uses of the above symbols are difficult to draw and inconvenient to use. Hence, Dalton, symbols are not used; it is only of historical importance.

Berzelius symbols

In 1813, **Jon Jakob Berzelius** devised a system using letters of alphabet. He argued that letters should be used because they could be written more easily than other signs. The modified version of Berzelius system follows under the heading

'System for Determining Symbols of the Elements'

1. The symbols of the most common elements, mainly non-metals, use the first letter of their English name

Element	Symbol
Boron	B
Carbon	C
Fluorine	F
Hydrogen	H
Iodine	I
Nitrogen	N
Oxygen	O
Phosphorus	P
Sulphur	S
Vanadium	V
Uranium	U

2. If the name of the element has the same initial letter as another element, then symbol uses the first and second letters of their English name.

Element	Symbol
Aluminium	Al
Barium	Ba
Beryllium	Be
Bismuth	Bi
Bromine	Br
Cobalt	Co
Gallium	Ga
Helium	He
Lithium	Li
Neon	Ne
Silicon	Si

3. If the first two letters of the names of elements are the same, then the symbol consists of first letter and second or third letter of English name that they do not have in common.

Element	Symbol
Argon	Ar
Arsenic	As
Chlorine	Cl
Chromium	Cr
Calcium	Ca
Cadmium	Cd
Magnesium	Mg
Manganese	Mn

4. Some symbols are based on the old names or Latin name of the element. There are eleven elements.

Name of element	Latin name	Symbol
Sodium	Natrium	Na
Potassium	Kalium	K
Iron	Ferrum	Fe
Copper	Cupurum	Cu
Silver	Argentum	Ag
Gold	Aurum	Au
Mercury	Hyderargyrum	Hg
Lead	Plumbum	Pb
Tin	Stannum	Sn
Antimony	Stibium	Sb
Tungsten	Wolfram	W

MORE TO KNOW

Names of some elements are derived from important country/scientist/colour/ mythological character/planet. Examples

Name	Symbol	Name derived from
Americium	Am	America (Country)
Europium	Eu	Europe(Country)
Nobelium	No	Alfred Nobel(scientist)
Iodine	I	Violet (colour, greek)
Mercury	Hg	God mercury (mythologic character)
Plutonium	Pu	Pluto (planet)
Neptunium	Np	Neptune (planet)
Uranium	U	Uranus (planet)

How to write a symbol?

While writing a symbol for an element, one has to follow the method given below.

1. If the element has a single English letter as a symbol, it should be written in capital letter.
2. For elements having two letter symbols, the first letter should be in capital followed by small letter.

Significance of the symbol of an element

Symbol of an element signifies

- Name of the element
- One atom of the element

For example,

- The symbol N stands for the element of nitrogen
- One atom of nitrogen

GROUP ACTIVITY 9.7

Here is an interesting game which helps you to remember the symbols and their names. Make cards as instructed and then form a small group with your class mates to play.

INSTRUCTIONS:

Prepare 15 cards with the name of elements written on them and 15 cards with their corresponding symbols. Here is a list of names of elements (you have a freedom to choose the name of the elements)

Hydrogen	Calcium	Arsenic	Sodium	Mercury
oxygen	Argon	Chlorine	Gold	Magnesium
Copper	Helium	Chromium	Iron	Manganese

How to play

1. Shuffle the 30 cards and place the cards face down on the table .
2. Start the game. Each player will get a chance of taking 2 cards at a time to see. If a player does not get the correct pair, then he/she should keep the cards at the original position. If the name and symbol of the cards match correctly, then he/she can show to all the players and can keep the correct pairs of cards with him/her. If correct pairs are shown, players will get another chance until the player makes wrong match. Game will continue till all the cards are taken up. The winner is the one having maximum number of cards.

ACTIVITY 9.8

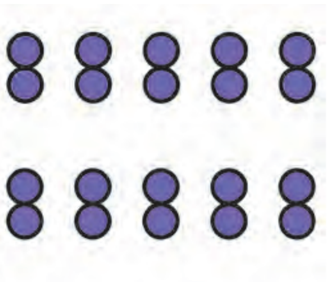
Analyse the number of elements, if any present in your name.

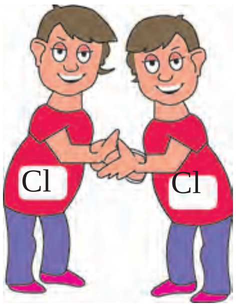
Here are few examples

Name	:	Gautam
Written as	:	GaUtAm
Elements	:	Ga-Gallium
		U-Uranium
		Am-Americium
Name	:	ARUN
Written as	:	ArUN
Elements	:	Ar- Argon
		U-Uranium
		N-Nitrogen

9.4. MOLECULE OF AN ELEMENT

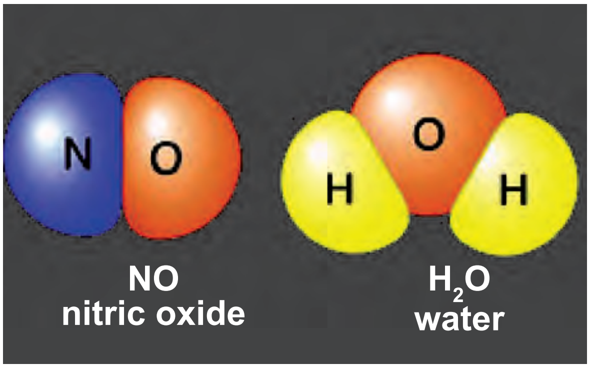
The molecule of an element contains two or more similar atoms. For example, a molecule of chlorine contains two atoms of chlorine; it is therefore written as Cl_2 (Chlorine). Similarly, a molecule of nitrogen contains two atoms of nitrogen; it is therefore written as N_2 (Nitrogen). molecules like Chlorine and nitrogen which consist of two atoms of the same kind, are called diatomic molecules. A molecule of ozone consists of three atoms of oxygen and is represented as O_3. Similarly, some molecules, like phosphorus (P_4) and sulphur (S_8), consists of more than two similar atoms.

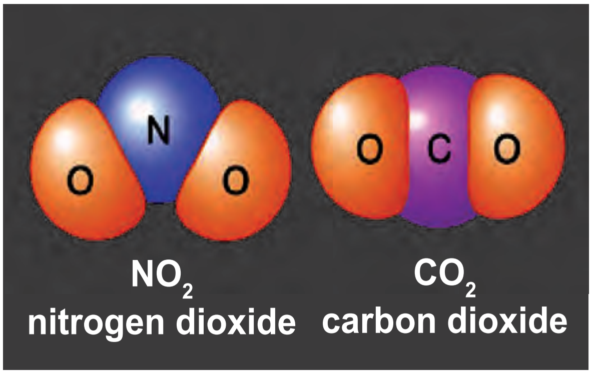




9.5. WHAT IS A COMPOUND?

Do you know that common salt, water, sugar, sand etc., which we use daily are said to be compounds? Similarly, our body is composed of hundreds of compounds. We have learnt that there is limited number of elements (<120), but number of compounds is unlimited.





From the picture, can you define a compound?

When two or more elements combine in a fixed ratio by mass, they form compound.

For example, water is a compound made of one oxygen atom and two hydrogen atoms in the ratio 1 : 2 by volume or 8 : 1 by mass.

A compound is a pure substance composed of two or more elements combined together chemically in a fixed ratio by mass.

Element + Element → Compound

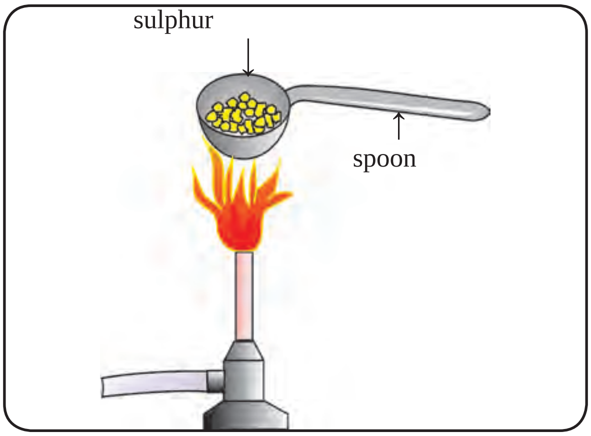
Nitrogen + Hydrogen → Ammonia

Carbon + Oxygen → Carbondioxide

Hydrogen + Oxygen → Water

ACTIVITY 9.9

Take a little sulphur in a spoon. Heat it. It burns with a blue flame which slowly disappears. You can smell a pungent odour. what is it due to?



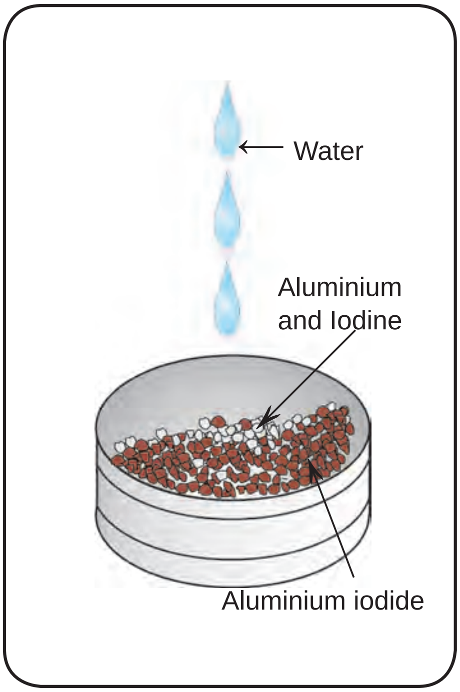
Sulphur combines with oxygen to form a colourless gas sulphur dioxide.

Sulphur + oxygen → Sulphur dioxide

(element) (element) (compound)

ACTIVITY 9.10

Take powdered iodine and aluminium in a bottle lid. Add 2 to 3 drops of water to this mixture. You can see a grayish black compound formed. What is it? (perform the experiment in out door).



The greyish black compound formed is aluminium iodide.

Aluminium + Iodine → Aluminium iodide

(element) (element) (compound)

ACTIVITY 9.11

Take 7g of iron powder and 4g of sulphur. Mix the two thoroughly. Take the mixture in a test tube and heat it over a flame. Remove the burner and observe. Then heat it to red hot and let it cool. What do you notice? You can see a grey brittle compound formed. What is it?

The grey brittle compound is iron sulphide

Iron + sulphur → Iron sulphide

(element) (element) (compound)

9.5.1. Characteristics of a compound

Now let us take iron sulphide and study the characteristics of a compound by performing simple experiments.

1. Iron sulphide contains iron and sulphur in the ratios 7 : 4. by mass. Hence, we can say that a chemical compound is formed by the **chemical reaction between two or more elements in a fixed proportion by mass.**
2. Iron in iron sulphide cannot be pulled away by using a magnet. Similarly sulphur present in iron sulphide cannot be removed by dissolving it in carbon disulphide because sulphur present in it does not dissolve in carbon disulphide. Hence we can conclude that the **components of the compound cannot be separated by simple physical methods.**
3. When a mixture of iron powder and sulphur is heated it glows red hot, and the glow stays for a while even when bunsen flame is removed. This shows that heat is given out. This reveals that **formation of a compound is associated with evolution or absorption of heat.**
4. Pure iron sulphide melts at a definite temperature. Hence a **compound has a fixed melting and boiling point.**
5. Iron sulphide is not attracted by magnet.When dilute sulphuric acid is added to iron sulphide, a colourless gas with rotten egg smell is produced due to hydrogen sulphide but not hydrogen. Thus iron present in the compound does not show its property. When carbon disulphide is added to sulphur does not dissolve in it. This shows that sulphur is also not able to show its characteristic property. Hence we can say **the properties of a compound are different from those of its component elements.**

CHEMISTRY

6. When a sample of iron sulphide is viewed by magnifying lens, it is found to be homogenous throughout its mass. No individual particle of iron and sulphur can be seen in iron sulphide. Hence **compound is homogenous.**

Now can you to list out the characteristics of compounds?

ACTIVITY 9.12

List the characteristics of compounds

1.................. ....
2.................. ....
3.................. ....
4..
5..
6..

9.5.2. Classification of compound

Let us learn to classify the compounds based on the origin or chemical components as

1. **Inorganic compounds**
   Compounds obtained from non living sources such as rock, minerals, etc., are called inorganic compounds. eg. Chalk, marble, baking powder, etc.

2. **Organic compounds**
   Compounds obtained from living sources such as plants, animals etc., are called organic compound.eg.Protein,waxes,oil, carbohydrates, etc.

ACTIVITY 9.13

Check whether sugar is a compound or not.

- Take some sugar in a test tube.
- Heat the test tube on a flame.
- The sugar will melt and turn brown.
- On further heating it starts charring and turning black.
- Look near the rim of the test tube. You will find small droplets of water.
- Since the water droplets have formed upon heating these cannot possibly be result of condensation from air. This shows that water has formed by decomposition of sugar.
- Black residue is carbon.
- So, sugar decomposed into carbon and water. We know that water is made up of elements of hydrogen and oxygen.

This shows that sugar is a compound.

MORE TO KNOW

- Talc is the softest known substance.(talcum powder)
- Water expands by about 10% as it freezes.
- It is estimated that plastic containers can resist decompostion for 50,000 years.
- Hydrofluoric acid will dissolve glass.

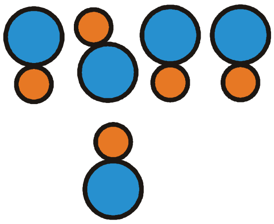
9.5.3. Uses of Compunds

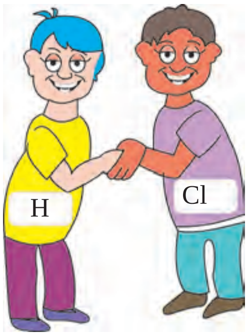
Let us tabulate the some compounds and their components that we use in our daily life.

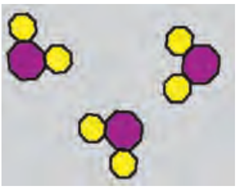
COMMON NAME	CHEMICAL NAME	COMPONENTS	USES
Water	Water	Hydrogen and oxygen	For drinking and as solvent
Table salt	Sodium chloride	Sodium and chlorine	Essential component of our daily diet, preservative for meat and fish.
Sugar	Sucrose	Carbon, hydrogen and oxygen	Preparation of sweets, toffees and fruit juices.
Baking soda	Sodium bicarbonate	Sodium, hydrogen , carbon and oxygen	Fire extinguisher, preparation of baking powder and preparation of cakes and bread.
Washing soda	Sodium carbonate	Sodium,carbon and oxygen	As cleaning agent in soap and softening of hard water.
Bleaching powder	Calcium oxy chloride	Calcium, oxygen and chlorine	As bleaching agent, disinfectant and sterilisation of drinking water.
Quick lime	Calcium oxide	Calcium and oxygen	Manufacture of cement and glass.
Slaked lime	Calcium hydroxide	Calcium , oxygen and hydrogen	White washing of walls.
Lime stone	Calcium carbonate	Calcium ,carbon and oxygen	Preparation of chalk pieces.

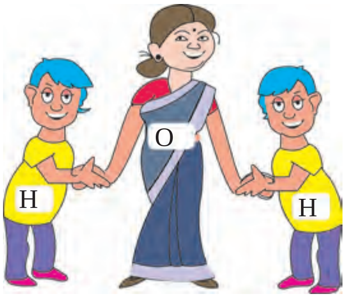
9.5.4. Molecule of compound

The molecule of a compound contains two or more different types of atoms. For example, the molecule of hydrogen chloride contains one atom of hydrogen and one atom of chlorine. Similarly, one molecule of water contains two hydrogen atoms and one atom of oxygen.









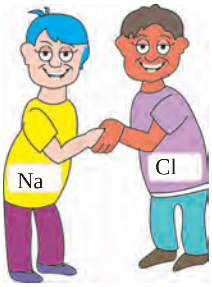
9.6. WHAT IS A FORMULA?

Just as an atom is represented by its symbol, a molecule of element or a compound is represented by means of a formula.

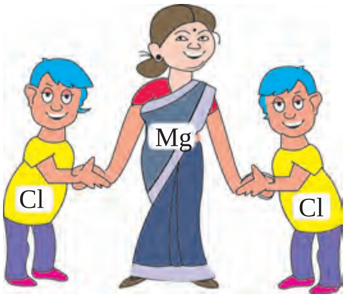
The formula represents the number of atoms of each element in the molecule. For example H_2 represents one molecule of hydrogen formed when two atoms of hydrogen combine.

The formula of water is H_2O. This indicates that two atoms of hydrogen chemically combined with one atom of oxygen to form water. The subscript " 2 " below H indicates the number of atoms of hydrogen present in one molecule of water. Notice that when only one atom is present the subscript "1" is not written.

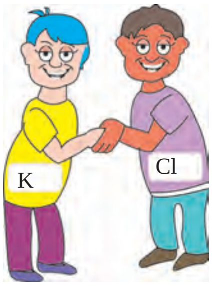
Let us learn to write formula from the following picture



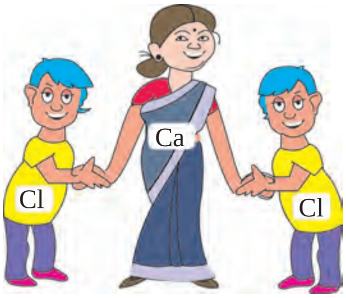
Formula is NaCl



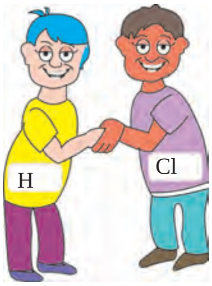
Formula is $MgCl_2$



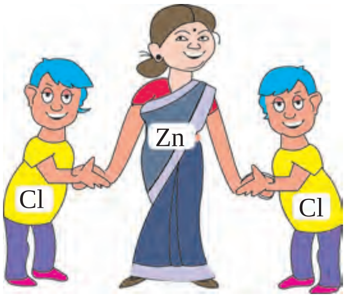
Formula is______



Formula is _______



Formula is _____



Formula is ______

9.7. WHAT IS VALENCY?

Two atoms of hydrogen combine with one atom of oxygen to form a molecule of water. While one atom of hydrogen combines with one atom of chlorine to form a molecule of hydrogen chloride. You could say that oxygen atom has a greater capacity to combine with hydrogen than the chlorine atom. This is somewhat like some people being friendly with many people, while others are satisfied with just one friend.

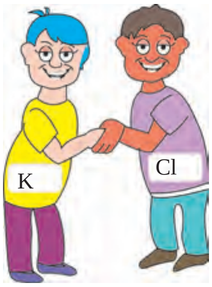
The compounds are formed by combination of atoms of different elements. During the formation of molecules of the compounds, atoms combined in a fixed proportion. This is due to the fact that different atoms have different combining capacities.

Valency can be defined as the combining capacity of an element.

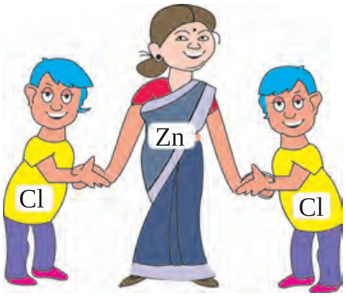
Valency with respect to hydrogen: The valency of hydrogen atom is taken as one and it is selected as the standard. Valency of other elements is expressed in terms of hydrogen. Valency of an element can also be defined as the number of hydrogen atoms which combine with one atom of the element.

Since most of the elements do not combine with hydrogen, the valency or the combining capacity of the element is also defined in terms of chlorine or oxygen.

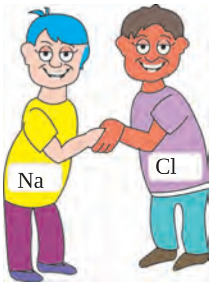
Valency With Respect to Chlorine: Since valency of chlorine is one, the number of chlorine atom with which one atom of an element can combine is called its valency.



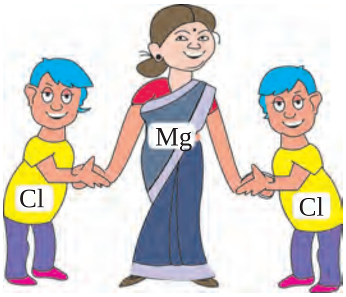
Valency of K is 1



Valency of Zn is 2

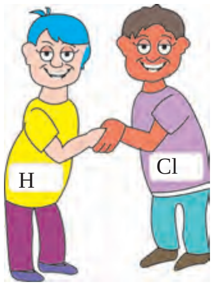


Valency of Na is ____

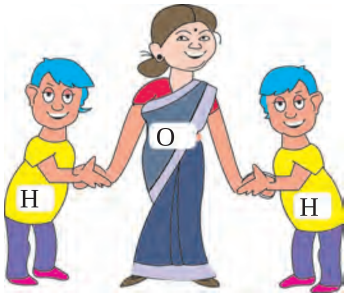


Valency of Mg is _____

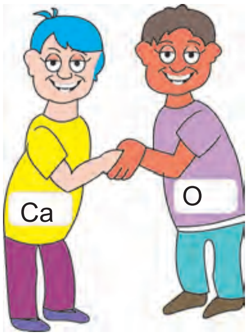
Valency with respect to Oxygen: We know that the valency of oxygen is 2. Double the number of oxygen atoms with which one atom of an element can combine is also called **valency.**



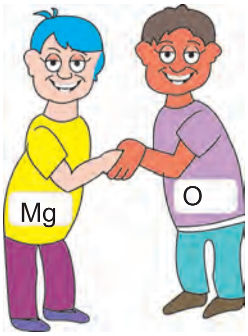
Valency of chlorine is 1



Valency of oxygen is 2

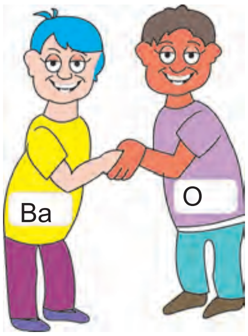


Valency of Ca is 2



Valency of Mg is 2

Valency of Zn is _____



Valency of Ba is _____

Certain elements exhibit more than one valency, are said to be variable valency.

For example,

Valency of Fe in $FeCl_2$ is 2   Valency of Fe in $FeCl_3$ is 3

Some elements, like helium and neon, do not combine with other elements. They have **zero valency**.

ACTIVITY 9.14

List out the zero valency elements from the periodic table.

EXTENDED LEARNING

New elements, till they are given permanent name, or those elements with disputed claims for discovery/synthesis, are named using three letters based on the Latin for their atomic number.

Number	0	1	2	3	4	5	6	7	8	9
symbol	n	u	b	t	q	p	h	s	o	e
Name	nil	un	bi	tri	quad	pent	hex	sept	oct	enn

The "entire symbol" name of elements must end with the suffix –ium.

To illustrate this system,

Let us assign to an element with atomic number	1	1	2
Name	Un	un	bium
Symbol	Uub		

GROUP ACTIVITY 9.15

Here is an interesting game which will help you remember the symbols and valencies of the elements you have learnt in this lesson. Make the cards as instructed and then form small groups with your classmates to play.

Instruction:

1. Prepare 3 cards each for every element given in the list. (3 X 13 =39)

Hydrogen	copper	magnesium	oxygen
Sodium	zinc	iron	sulphur
Potassium	lead	calcium	chlorine

Mercury

2. Then prepare 3 cards each for the same elements. This time use their symbol instead of their names (3 X13=39)

   H Cu Mg O Na Zn Fe S K Pb Ca Cl Hg

3. Prepare 30 cards with '2' written on them and 12 cards with '1' written on them. The '2' and '1' cards represent the valency.
4. There should be a total 120 cards.

How to Play:

Eight players can play at a time. All the cards are distributed among the players. Each player gets 15 cards. At each turn, a player can do one of the following:

1. Make a set of three cards. One set is made of a card which has the name of an element on it, a card with its symbol and a card with its valency.
2. Draw a card from the person sitting on the left. Check if this card helps to make a set as explained above. If yes, place the set face up on the table.

A person who makes a set with a wrong symbol or valency card will have to skip next turn as a penalty. The round ends when one of the players has used up all the cards. The player who has used up all the cards or has the lowest number of cards left in hand is the winner.

EVALUATION

1. Water is made up of two elements, hydrogen and oxygen. Water is a liquid, whereas hydrogen and oxygen are gases. Hydrogen catches fire easily. Oxygen helps in burning. Water is used to put off the fires.

   From the above information, answer the following questions.

   a) What are the elements present in water?

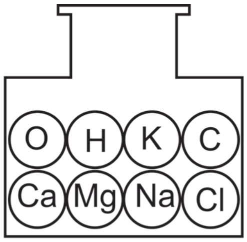
   b) In which state do these elements exist?

   c) Write the property of hydrogen.

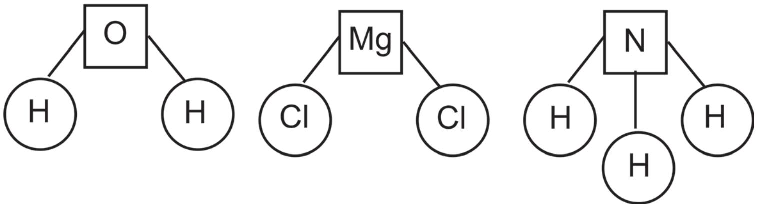
   d) Write the property of oxygen.

   e) Do the properties of water differ from hydrogen and oxygen?

2. Using the elements enclosed in the bottle, frame formulae for some compounds.



3. Find the valency for the element represented in the square box.



4. Write the names of the planets(Greek God) after which these elements are named.

   a) Plutonium b) Neptunium c) Uranium

Project Ideas

1. i. Obtain samples of the following materials.
   Sugar, Common salt, Water, Copper wire, Pencil lead, eraser, Iron

   ii.Observe each material and mention its state or appearance.

   iii.Classify the samples into element or compound.

2. List several items that are made of common elements like iron, copper and aluminium,which you find in your home or around your home. Indicate the name of the elements they are made of and their symbols.

3. Using clay, water colour, tooth pick (small bamboo stick), make models of elements and compounds of your choice.

Project Work

Take three samples namely, iron pieces, copper wire and charcoal. Perform the following tests and tick appropriate observations. Based on the observation classify the samples into metal and non-metal.

Test	Observation		
	Iron	**Copperwire**	**Charcoal**
Addition of water	Soluble/insoluble	Soluble/insoluble	Soluble/insoluble
Drop it down	Sonorous/ nonsonorous	Sonorous/ nonsonorous	Sonorous/ nonsonorous
Conductor of electricity(using copper wire, cell and bulb)	Good/bad	Good/bad	Good/bad

Result:

The sample :

Iron is a ________.Copperwire is a ________.Charcoal is a _______

FURTHER REFERENCE

Book

Inorganic chemistry - Puri and Sharma - Vishal publications.

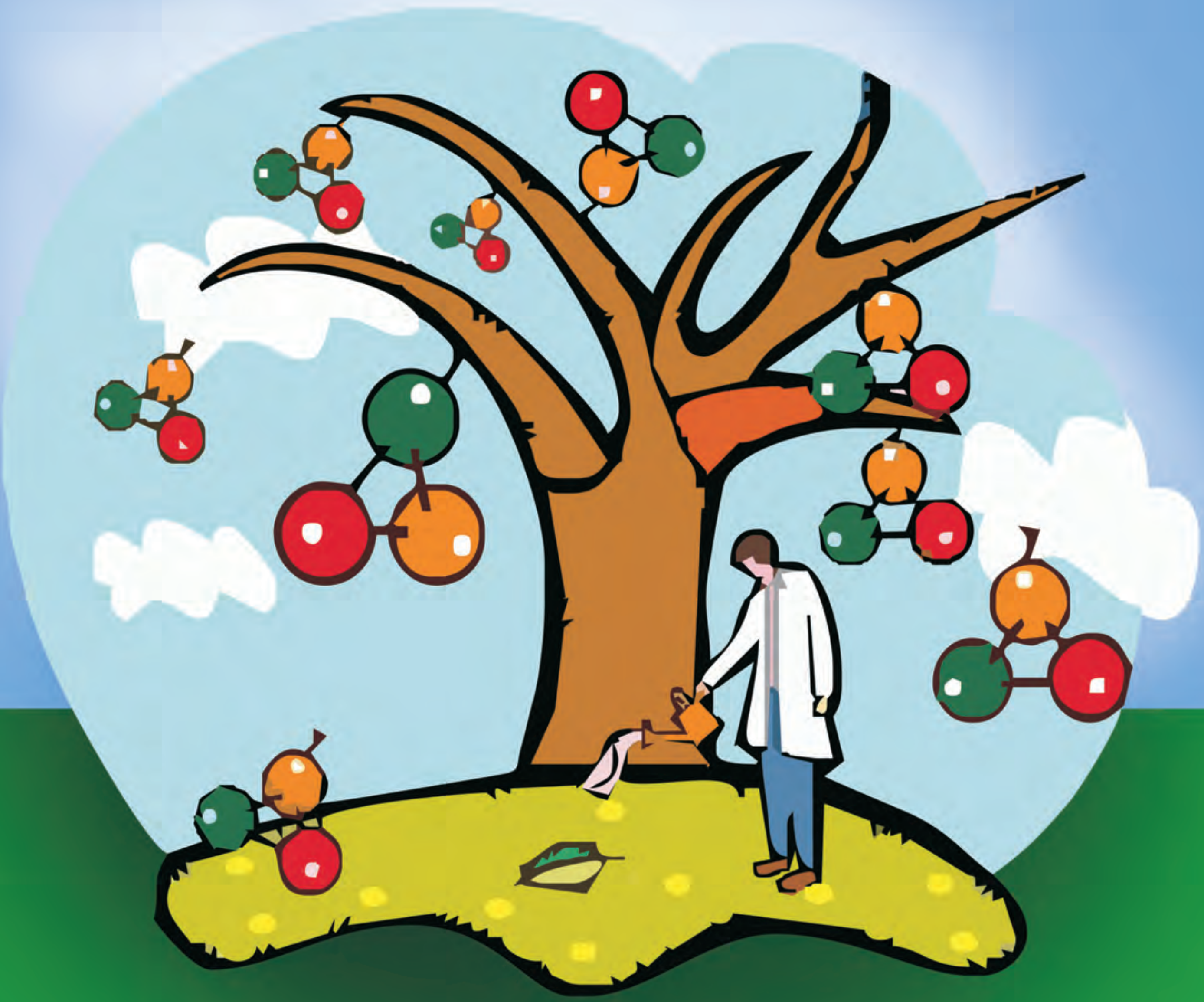
Websites

www.freshney.org

www.authorstream.com

CHEMISTRY

CHAPTER 10



ATOMIC STRUCTURE

10. ATOMIC STRUCTURE

We can see several things in the picture. All these living and non living things are made up of matter. Atoms are the building blocks of all matter. Atoms are extremely small in size and it is expressed in terms of 10^{-10} m (1 $\mathring{A}$). Let us learn how ancient scientists and philosophers described the structure of atoms.

10.1. ANCIENT VIEWS ON ATOMIC STRUCTURE

Maharishi Kanad, an ancient scholar in the 6th century BC in India,believed that matter consists of parmanu (anu) which are the ultimate minute particles. He further argued that parmanu undergoes combination of two or three before forming a material. This idea is the same as the idea of molecules.

Later, in about 400 BC, the Greek Philosopher Democritus, also proposed that matter is made up atoms. The word 'atom' is coined because these small particles of matter are assumed to be indivisible. In Greek language, atom means 'incapability of being cut".

Greek stamp honouring Democritus and his modern significance

10.2. LAWS OF CHEMICAL COMBINATIONS

The ideas of these philosophers were not universally accepted because there was no experimental evidence to support them. Scientists continued in accumulating the data and as the time

passed, more and more observations and views regarding the qualitative and quantitative aspects of matter were noticed. This observation laid down some general statements which are now known as **Laws of Chemical combinations.** They includes

1. Law of Conservation of Mass
2. Law of Definite Proportions
3. Law of Reciprocal Proportions
4. Law of Multiple Proportions and
5. Gay Lussac's Law of Combining Volume

Let us discuss the first two laws of chemical combinations.

1 Law of conservation of mass: (LAVOISIER 1774)

When hydrogen gas burns and combines with oxygen to yield water, the mass of water formed is equal to the mass of hydrogen and oxygen consumed. This is in accordance with law of conservation of mass which is defined as "Mass is neither created nor destroyed during physical or chemical change"

$$2H_2 + O_2 \longrightarrow 2H_2O$$

4g 32g 36g

ATOMIC MASSES:

H-1, O-16, C-12

In other words, total mass of material present after a chemical reaction is the same as the total mass before chemical reaction.

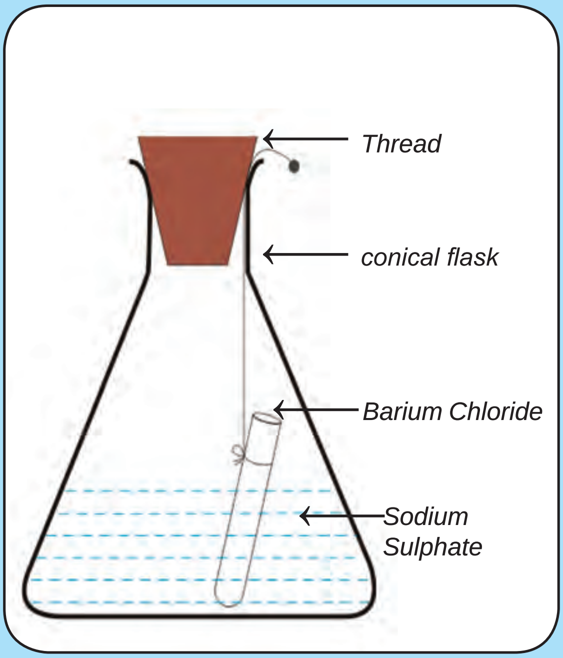
You will notice that there is no change in mass. Hence, during the physical change the total mass of the matter remains the same.

ACTIVITY 10.1

Take a piece of ice in a clear well-stoppered conical flask and weigh it. Leave the flask for some time. Now you observe the flask. The ice melts and becomes water. This is a physical change. After some time, weigh the flask again. What do you will notice?

ACTIVITY 10.2

Let us demonstrate the Law of Conservation of Mass by doing this activity.



Prepare 5% solutions(5g in 100 ml water)of barium chloride and sodium sulphate separately. Take some solution of sodium sulphate in a conical flask and some solution of barium chloride in the test tube. Hang the test tube in the conical flask . Weigh the flask with its contents. Note down the weight. Now mix the two solutions taken in the flask by tilting and swirling the flask. Shake well. Weigh the flask after the chemical reaction has taken place. Note down the weight. Record your observation when the reaction between the two solutions takes place.

What happens in the conical flask when the two solutions are mixed? Does the weight of the flask before and after chemical reaction remains the same? What do you conclude from this experiment?

Barium chloride reacts with sodium sulphate solution to form a white precipitate of barium sulphate and sodium chloride .

The mass of flask before and after chemical reaction were found to be the same. This activity verifies the law of conservation of mass.

2. Law of Definite Proportions: (PROUST 1779)

This law states that "A pure chemical compound prepared by any method consists of the same elements combined together in a fixed proportion by mass".

Joseph Louis Proust ***(1754 - 1826)***

Example: Water obtained from different sources like rain, well, sea, river etc., will always consist of the same two elements, hydrogen and oxygen, in the ratio 1:8.

$$H_2O$$

Atomic masses: 2:16 or 1:8

10.3. DALTON'S ATOMIC THEORY

Keeping in view of the law of chemical combinations and the work of Greek philosophers, a meaningful atomic theory was finally proposed by an English school teacher John Dalton (1803-1807). His ideas have been summarised(postulates) as.

1. Matter is made up of small, indivisible particles called atoms.
2. Atom can be neither created nor destroyed.

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3. Atoms of the same element are identical in all respects.
4. Atoms of different elements are different in all respects.
5. Atoms of different elements may combine with each other in a fixed simple whole number ratio to form "compound atoms" (or molecules).
6. Atom is the smallest particle that takes part in chemical reaction.

John Dalton, son of a poor weaver, began his career as a village school teacher at the age of 12. He became Principal of the school seven years later. In 1793, he moved to Manchester to teach Physics, Chemistry and Mathematics in a college. He proposed his atomic theory in 1803. He carefully recorded each day the temperature, pressure and amount of rainfall from his youth till the end. He was a meticulous meteorologist.

10.3.1. Merits of Dalton's Atomic Theory

1. It gave a satisfactory explanation for the law of chemical combinations (law of conservation of mass and law of definite proportions)
2. It explained most of the properties of gases and liquids known at that time.

10.3.2. Demerits of Dalton's Atomic theory

1. It failed to explain why the atoms of different elements differ in their size, mass and valency.
2. It failed to explain how and why atoms of the same or different elements combine together to form the compound atoms.
3. It also does not explain the nature of binding forces that keep the atoms together in a compound.
4. It could not give a clear distinction between the atom and molecule.

10.4. ELECTRICAL NATURE OF MATTER

Before proceeding to understand the composition of atom, it is better to learn electrical nature of matter. For understanding the electrical nature of matter, let us carry out the following activities.

ACTIVITY 10.3

1. Comb your dry hair repeatedly with a plastic comb. Immediately bring the comb close to small bits of paper. Does the comb attract small piece of paper?
2. Rub a glass rod with a silk cloth and bring the rod near an inflated balloon. Observe What happens?

From these activities, can we conclude that on rubbing two objects together, they become electrically charged? Where does this charge come from? This question can be answered by knowing that an atom consists of charged particles.

The first direct experimental evidence for the electrical nature of matter came from the experiments of Michale Faraday.

He showed from his experiments that electricity is composed of particles called 'atoms of **electricity'.**

It was George Johnstone Stoney, an Irish Physicist who first proposed the word 'electron' for atom of electricity' in 1891.His contribution to research in this area laid the foundations for the eventual discovery of particles by J.J. Thomson in 1897.

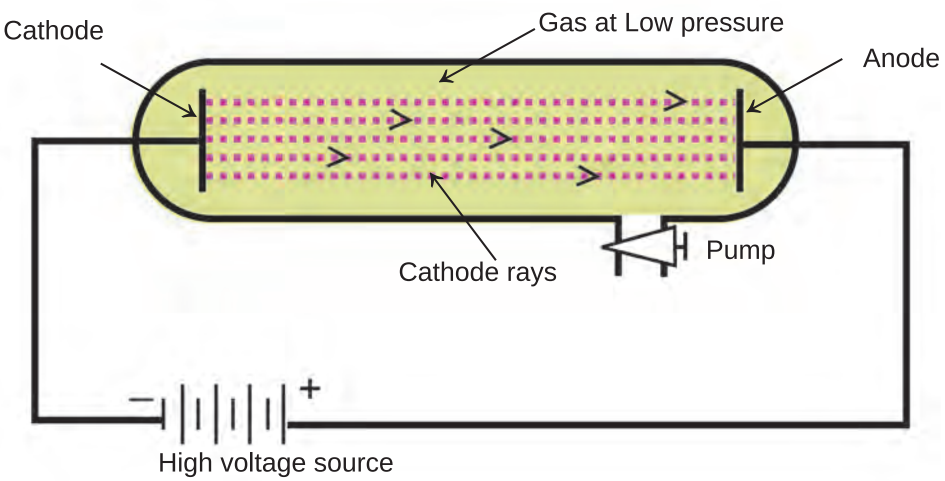
10.5. DISCOVERY OF FUNDAMENTAL PARTICLES

An experiment to investigate the phenomenon that takes place when high voltage is applied through a tube containing gas at low pressure laid the foundation to the discovery of fundamental particles.

In 1878, Sir William Crooke, while conducting an experiment using a discharge tube, found certain visible rays travelling between two metal electrodes. These rays are known as Crooke's Rays or cathode rays. The discharge tube used in the experiment is now referred to as Crookes tube or more popularly as Cathode Ray Tube **(CRT)**. It is a long glass tube filled with gas and sealed at both the ends. It consist of two metal plates (which act as electrodes) connected with high voltage. The electrode which is connected to the negative terminal of the battery is called the cathode (negative electrode). The electrode connected to the positive terminal is called the anode (positive electrode). There is a side tube which is connected to a pump. The pump is used to lower the pressure inside the discharge tube.

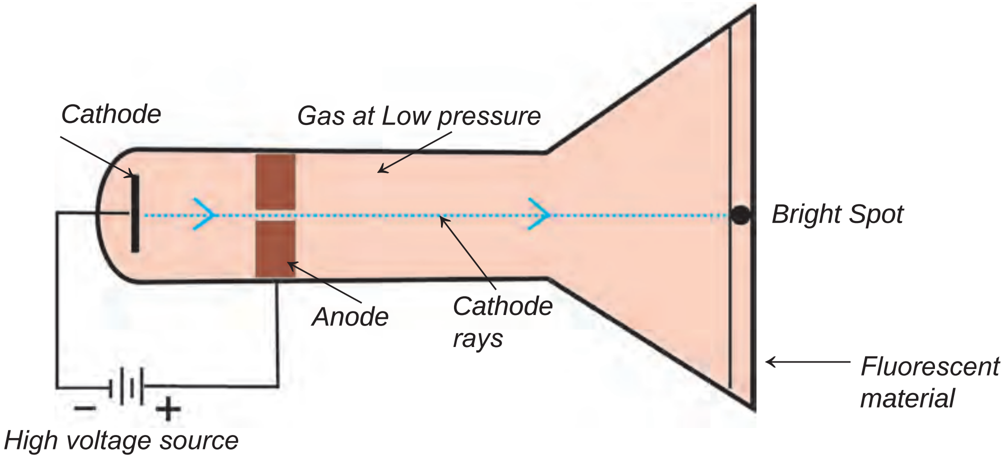
MORE TO KNOW

The fact that air is a poor conductor of electricity is a blessing in disguise for us. Imagine what might have happened if air had been a good conductor of electricity. All of us might have been electrocuted whenever a minor spark is produced by accident.



10.5.1. Discovery of electron

Later, J.J. Thomson also found that when a high voltage of 10,000 V was applied between the electrodes present in a partially evacuated cathode ray tube at a pressure of 0.01mm of mercury, a bright spot of light was formed on the screen coated with a fluorescent material placed at the other end of the tube. The fluorescent material coated on the screen started to glow because it was struck by the ray which originated from the cathode. Since these rays were emitted by the cathode, he named these rays as cathode rays. Later, he named it as electrons.

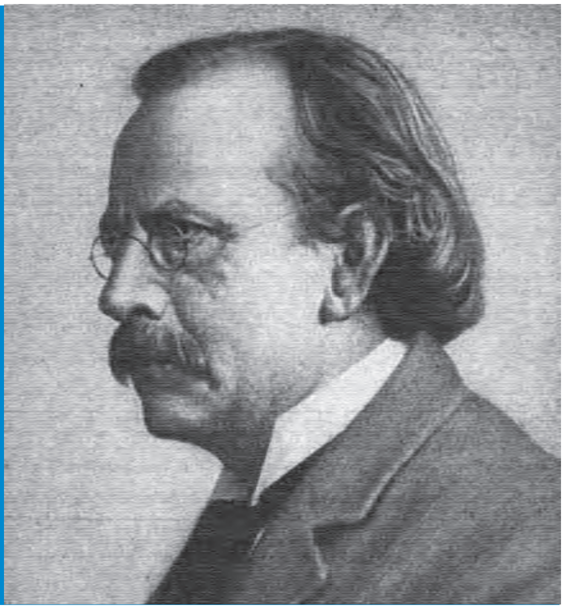


MORE TO KNOW

FLUORESCENT MATERIAL

When invisible radiation falls on materials like zinc sulphide, they will emit visible light (or glow). This is called fluorescent material.

"J.J.Thomson, a British Scientist, is credited with discovery of electron and isotopes."

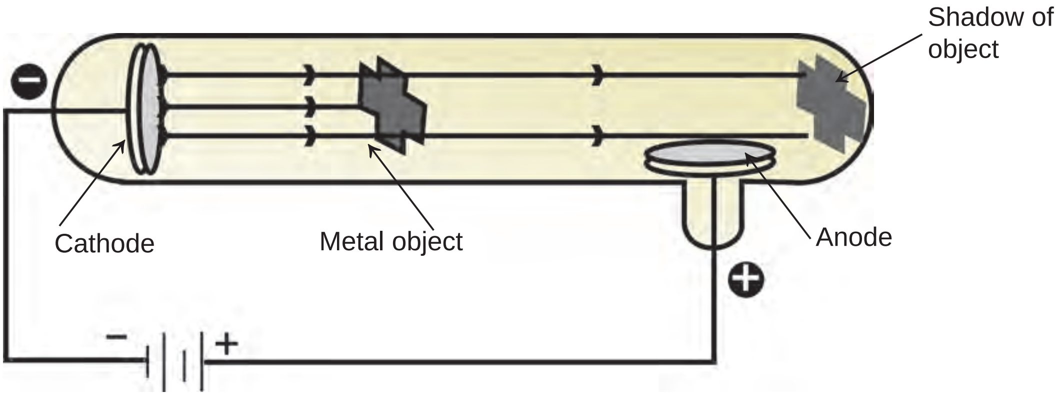


10.5.2. Properties of cathode rays

J.J. Thomson and others studied the properties of these cathode rays by conducting the following experiments.

Experiment 1

Cathode rays fall on a small object which is placed in between the cathode and anode.A shadow which is of the same shape as the object is observed on the wall opposite to the cathode.

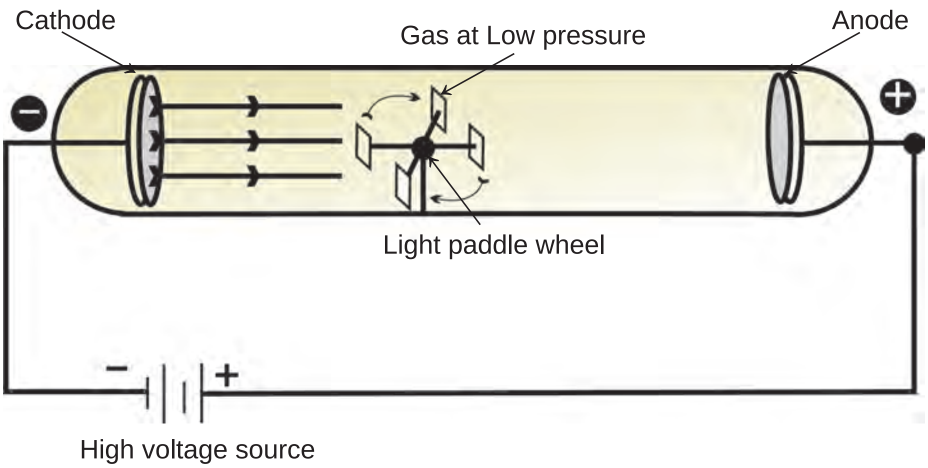


High voltage source

Conclusion: The cathode rays travel in straight lines.

Experiment 2

Cathode rays fall on a light paddle wheel which is placed between cathode and anode. The wheel starts rotating.



Conclusion: Cathode rays are made up of small particles that have mass and kinetic energy.

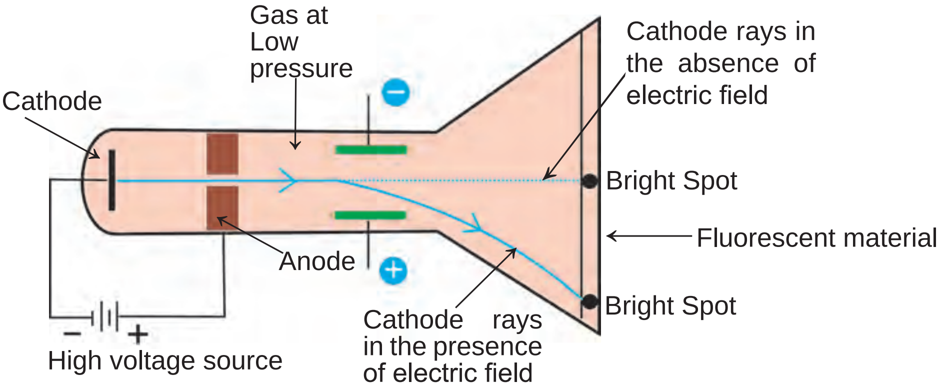
Experiment 3

Cathode rays are passed through an electric field. The cathode rays are deflected towards the positive plate of electric field.

Conclusion: The cathode rays are negatively charged particles.

Experiment 4

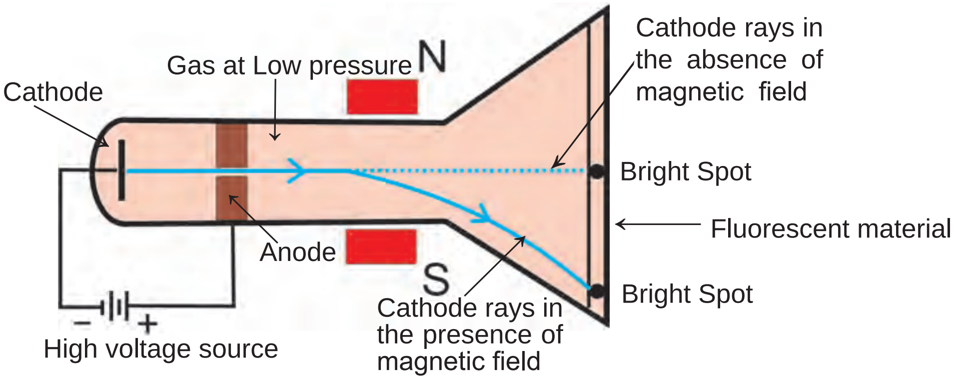
Cathode rays are passed through a magnetic field . The deflection of the rays is perpendicular to the applied magnetic field.



Conclusion: The direction of deflection indicates that the cathode rays constitute negatively charged particles. These negatively charged particles are called **electrons.**

Experiment 5

These experiments were repeated by taking different gases / different cathodes in the discharge tube.



No change in properties.

Conclusion: The nature of the cathode rays does not depend on the nature of the gas inside the tube or the cathode used.

Now can we write the properties of cathode ray from the conclusion?

ACTIVITY 10.4

List the properties of cathode rays

1.
2.
3.
4.

10.5.3. Discovery of protons

The presence of positive charged particles in the atom has been predicted by Goldstein based on the conception that atom, being electrically neutral in nature, should necessarily possess positively charged particles to balance the negatively charged electrons.

Goldstein's Experiment (1886)

Goldstein repeated the cathode ray experiment by using a perforated cathode. On applying a high voltage under low pressure, he observed a faint red glow on the wall behind the cathode. Since these rays originated from the

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anode, they were called anode rays or canal rays or positive rays. Anode rays were found as a stream of positively charged particles.

When hydrogen gas is taken in a discharge tube, the positively charged particles obtained from hydrogen gas are called PROTONS. Each of these protons is produced when one electron is removed from one hydrogen atom.

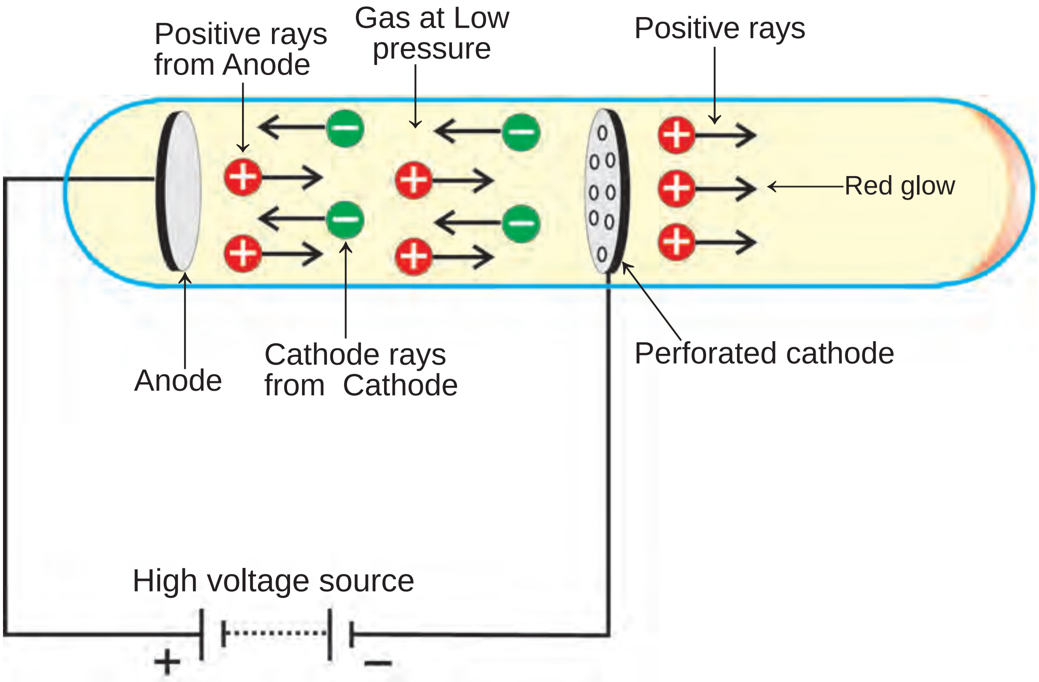
$$H \longrightarrow H^{+} \quad + \quad e^{-}$$

anode rays **cathode rays**

Thus, proton can be defined as hydrogen ion (H^+)

Properties of anode rays

1. Anode rays travel in straight lines
2. Anode rays consist of material particles since they rotate the light paddle wheel placed in their path.
3. Anode rays are deflected by electric and magnetic field since they deflect towards negatively charged plate. This shows that anode rays consist of positively charged particles.
4. The properties of anode rays depend upon the nature of gas taken in the discharge tube.



5. The mass of the particle is the same as the atomic mass of the gas inside the discharge tube.

10.5.4. Properties of fundamental particles

Particle	mass (atomic mass unit)	Relative charge
ELECTRON(e)	0.00054 a.m.u	-1
PROTON(p)	1.00778 a.m.u.	+1

10.6. WHY ATOMIC MODEL?

The study of electrical phenomenon in gases led to the historical conclusion that atom is divisible, and made up of

1. Electrons
2. Protons

The study of the properties of the fundamental particles, like electron and proton, led to the conception of various atom models.

Atom model is the description of depicting the arrangement of various fundamental particles inside the atom. The systematic study of various atomic models gives us an insight into the understanding of the primary structure of atom.

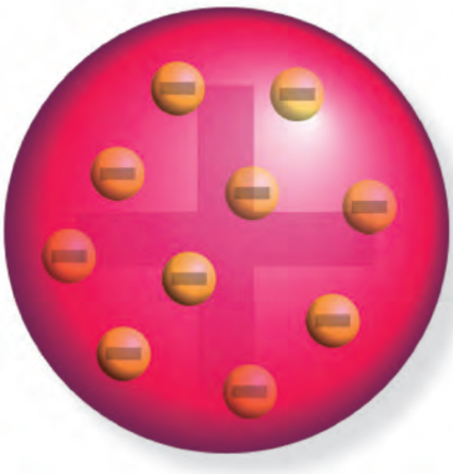
10.6.1. Thomson's atomic model (1904)

Thomson's atom model can be compared to the water melon. The red edible portion represents the positive sphere, and black seeds are like electrons embedded.

According to J.J. Thomson,

1. An atom consists of a positively charged sphere and electrons are embedded in that sphere.
2. The positive and negative charges are equal in magnitude hence the atom as a whole is electrically neutral.

Thomson's model of atom is popularly known as plum pudding or apple pie model.



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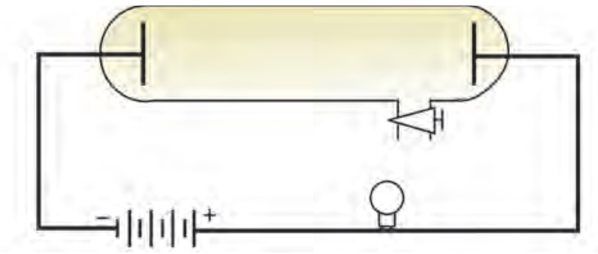
10.6.2. Limitation of Thomson model

Thomson's model could successfully explain the electrical neutrality of atom. However, it failed to explain how the positively charged particles are shielded from the negatively charged electrons without getting neutralised.

EVALUATION

1. Akbar took a conical flask and he put some ice cubes into it and closed it with a stopper. Then, he found the weight of the conical flask in a balance and its value was 150 g. After sometime, ice starts melting and becomes water. He weighed it again. The weight is 150 g. What inference would you draw from this experiment?
2. Ram, Goutam, David, Saleem collected different samples of water from a well, a pond, a river and underground water. All these samples were given to a testing laboratory. The test result shows the ratio of hydrogen to oxygen is 1:8.
    a) What conclusion would you draw from the above experiment?
    b) Which law of chemical combination does it obey?
3. The postulates of Dalton's law are given below;
    a) Atom can be neither created nor destroyed.
    b) Atoms of different elements may combine with each other in a fixed simple whole number ratio to form compound atom.
    i. Which postulate of Dalton's atomic theory is based on law of definite proportion?
    ii. Which postulate of Dalton's atomic theory is based on law of conservation of mass?
4. In the laboratory Pooja prepared carbon dioxide in the laboratory that contains 15g of carbon and 20 g of oxygen. Ram also prepared carbon dioxide by another method, it contained 42.9% of carbon. Show that data of Pooja and Ram are in accordance with law of definite proportions.
5. Cathode rays falls on a small object between the cathode and anode. A shadow which is of the same shape as the object is observed on the wall opposite to the cathode. What conclusion can you draw from the above statement regarding the properties of cathode ray?

6.Gomathi enclosed a certain gas in discharge tube, connected as shown in the figure.



She applied high voltage but bulb does not glow. What has Gomathi to do to make the bulb glow?

7.Identify the wrong statement regarding the properties of cathode rays and correct them.

a) Cathode rays are made up of large particles, has mass and kinetic energy.

b) Cathode rays are deflected by magnetic field.

c) Cathode rays depend on the nature of the gas inside the tube.

8. Fill in the blanks:

a) ______is negatively charged particle. (Electron/Proton)

b) Proton is deflected towards ___ charged particle.(positively, negatively)

Project Work:

Using cardboard, round shaped chart paper, gum, cotton, red coloured sketch pen / water colour and dry black water melon seed or black beads, construct a model of Thomson atom. Label the model and place them or display in your classroom. Write a brief description of the Thomson model.

FURTHER REFERENCE

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hhtp://www.about.chem

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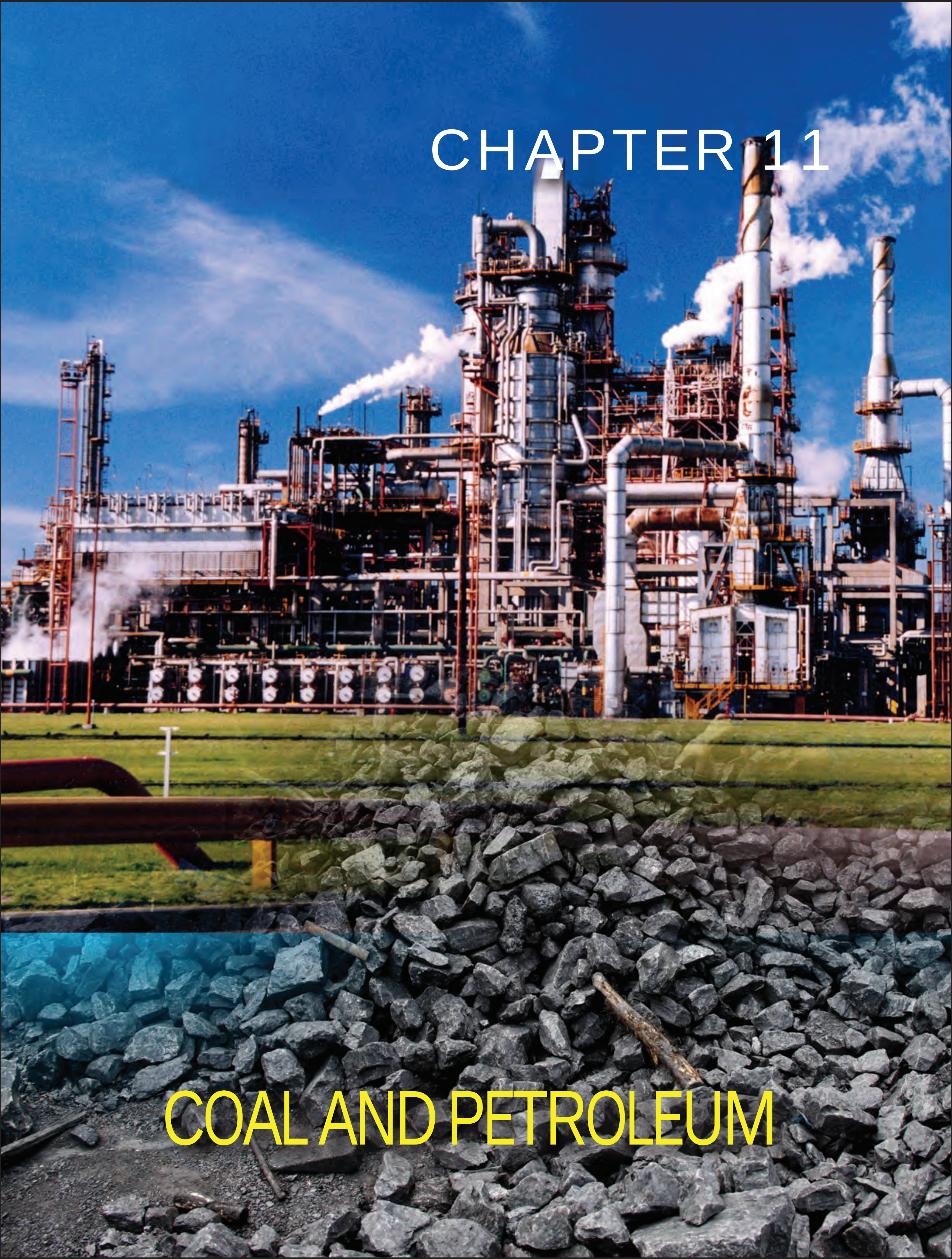
CHAPTER 11

COAL AND PETROLEUM



11. COAL AND PETROLEUM

Do you know Ram? He is studying in 8th standard. He goes to school by bicycle. His father goes to office by car. His brother goes to college by bus. Ram's family cooks food using gas stove.

What are the fuels used by Ram's family members in the above activity? Petrol, Diesel and L.P.G. (Liquified Petroleum Gas)

Fuels

ACTIVITY 11.1

Tabulate the following vehicles that uses (i) Man power (ii) Fuel

Man Power	Fuel

MORE TO KNOW

Why is a burning candle extinguished when covered by a jar?

Combustion takes place in the presence of air. When the air supply is cut off, the burning candle gets extinguished.

Substances that burn in air to give heat energy are called fuels.

Fossil Fuels

Fossil Fuels are defined as naturally occuring substances that are extracted from the earth and also useful as fuels.

Coal, crude oil and natural gas are collectively called as fossil fuels.

MORE TO KNOW

- Coal will have higher sulphur content if it was formed in swamps covered by sea water.
- Combustion caused by the chemical union of Hydrocarbon with oxygen. When heat is applied, the fuel molecules are broken down and release heat energy.

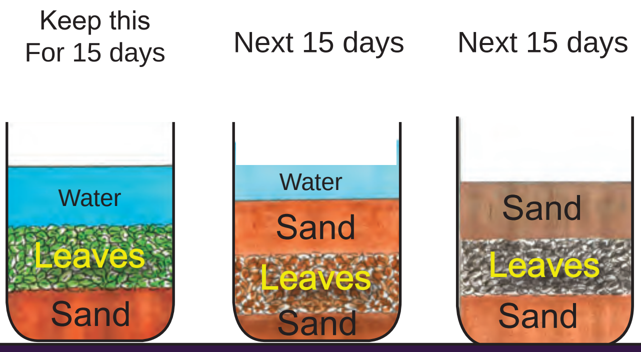
11.1. COAL

Occurence of coal

Coal mining was started in India in 1774. India ranks now third among the coal producing countries in the world. USA and China have 2/3 of world's coal reserve.

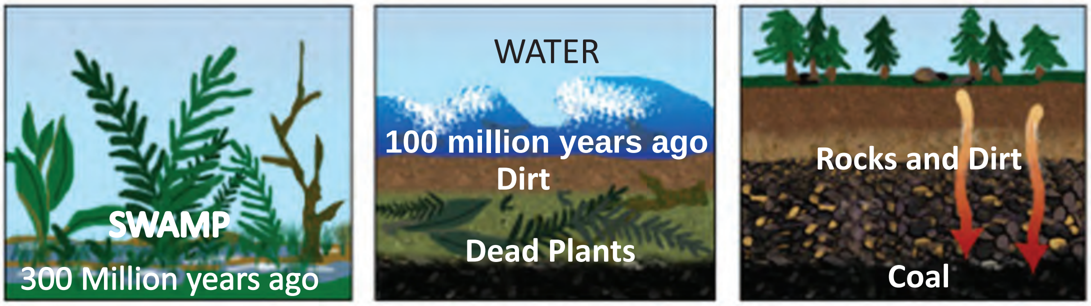
ACTIVITY 11.2

1. Take a glass beaker and spread 2 inches of sand at the bottom. Then pour some water and drop small leaves, sticks and pieces of fern on sand. Let it stand for two weeks.
2. Note down the colour change.
3. Gently put some mud on top of the plant layer to a depth of 2 inches.
4. Wait for two weeks and drain the water. Let it dry for another two weeks. Now you could see fossil imprint between the sand layers.



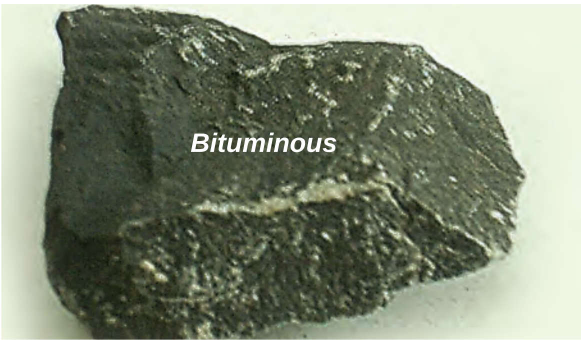
Do you know how coal was formed?

Three hundred and fifty million years ago, some plants grew into giant ferns and mosses. These plants got buried into the bottom of the soil and deposited as fossil due to heat and pressure. The decaying plants were pressed and coal was formed.



11.1.1. Types Of Coal

1. Lignite (Brown Coal) contains 25 – 35 % carbon.
2. Bituminous coal (Soft coal) contains 45 – 86 % carbon.
3. Anthracite coal (Hard coal – It has the highest heat energy) contain 87 – 97%carbon.



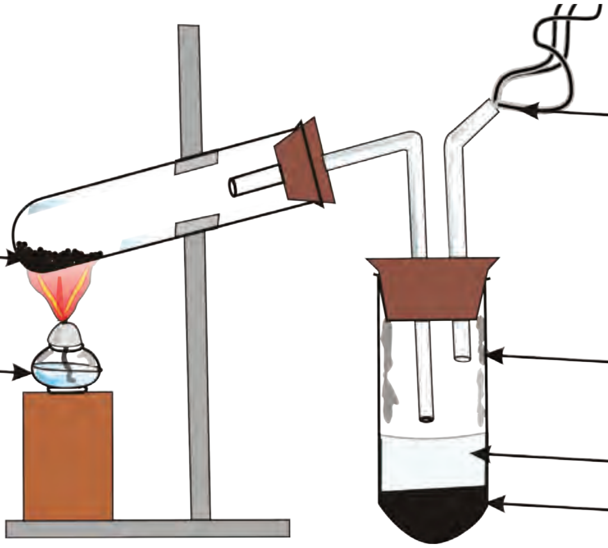
ACTIVITY 11.3

Take a little coal and heat it as shown in the figure.

CHEMISTRY

When coal is heated in the absence of air is called destrictive distillation of coal. We get many useful products.

Destrictive distillation of coal



Coal products and their uses

S.No	Coal Products	Uses
1.	Coal Gas	As a fuel in cooking food
2.	Liquid Ammonia	To make fertilisers
3.	Gas Carbon	Carbon electrodes in batteries
4.	Coke	As a fuel and as a reducing agent in steel manufacturing
5.	Coal Tar	To make plastics, paints, dyes,naphthalene balls and explosives

MORE TO KNOW

1000 kg of coal contains

- 700 kg of coke, b. 100 litres of ammonia
- 50 litres of coal tar, d. 400 m^3 of coal gas

Consumption of Coal

The coal that we consume in one day what the earth took 1000 years to form.The amount of coal we produce is greater than the amount that we consume.

11.2. PETROLEUM

Dead plants and animals buried at the bottom of the sea millions of years ago. They got covered with layers of sand and clay. Due to high pressure and temperature, they got transformed into petroleum.

Petroleum and Natural Gas Formation

MORE TO KNOW

Countries like Dubai, Saudi Arabia, Abu Dhabi etc.have become very rich in recent years. Why?

The world's first petroleum well was drilled in Pennsylvania, USA in 1859.

Eight years later in 1867,oil was struck at Makum in Assam

11.2.1. Occurrence of Petroleum

The chief petroleum producing countries are U.S.A Kuwait, Iraq, Persia, Russia and Mexico.

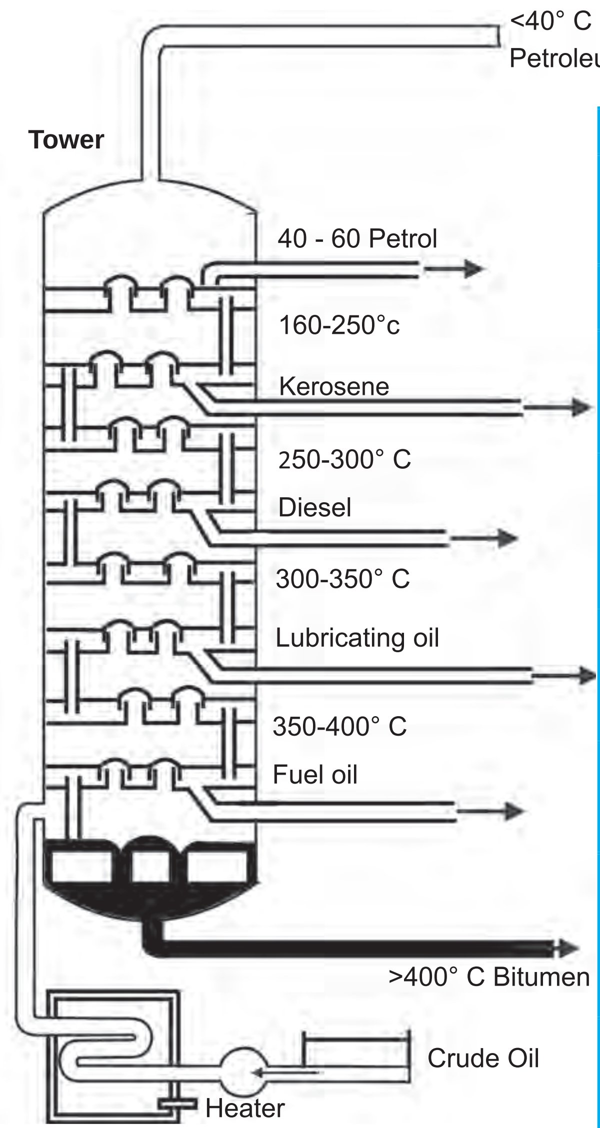
In India, petroleum is found in Assam, Gujarat, Maharashtra (Mumbai high) and Andhra Pradesh (Godavari and Krishna basin) and Tamil Nadu (Cauveri Basins).

Petroleum is obtained by drilling through the earth.The crude oil is pumped out from a well as a black liquid.

Refining of crude petroleum

Petroleum is a dark oily liquid. It is a mixture of various consititutents such as petroleum gas, petrol, diesel, lubricating oil, paraffain wax, etc. The process of separting various constitutents / fractions of petroleum by fractional distillation in fractionating columns is known as refining of petroleum. The process of heating a mixture of many liquids having different boiling points and separating them by cooling is called fractional distillation.

Crude petroleum is first heated to about 400° C in a furnace. As the vapours of crude oil move up the tower,they condense according to their boiling point ranges. These are the various fractions which make up crude oil. The various fractions of petroleum obtained are tabulated below;



Fraction	Uses
Petroleum Gas	Fuel for home (LPG)
Petrol	Motor fuel
Kerosene	Fuel for stove and jet aircrafts.
Diesel	Fuel for heavy motor vehicles.
Lubricating oil	Lubrication
Fuel Oil	Fuel for Power Stations and Ship
Paraffin wax	Candles, Vaseline
Bitumen	Paints, road surfacing

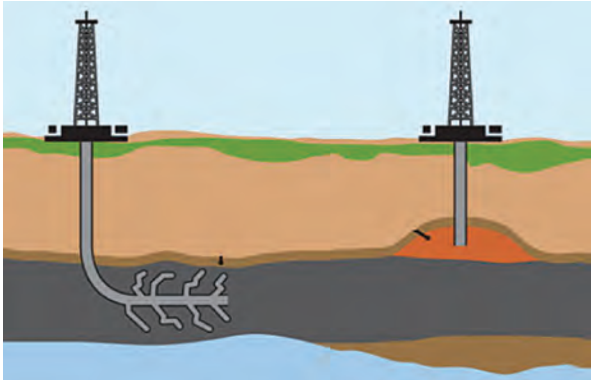
MORE TO KNOW

Many useful substances are obtained from petroleum and natural gas. These are termed as 'Petrochemicals. These are used in the manufacture of detergents, fibres,polyethene,and other man-made plastics. Hydrogen gas obtained from natural gas, is used in the production of fertilisers. Due to its great commercial importance, pertoleum is also called 'black gold'.

MORE TO KNOW

If we consume petroleum in this rate, in the year 2,050 there may be no petroleum at all.

11.3. NATURAL GAS



Formation of Natural gas

Natural gas is formed whenever vegetation decomposes in marshes, sewage and in coal or petroleum mines. It is made up of 90 % methane.

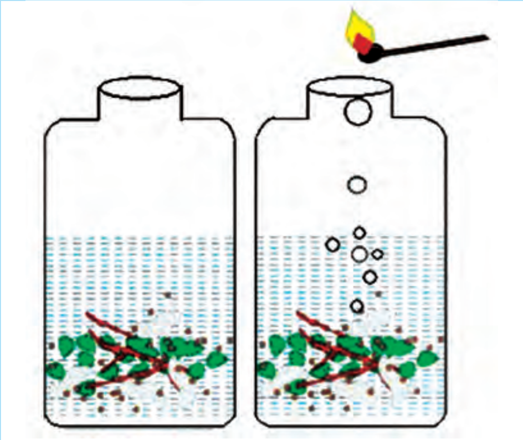
11.3.1. Occurence

There is a vast reserves of Natural gas in Tripura, Rajasthan, Maharastra, Andhra pradesh (Krishna, Godavari Basins) and Tamilnadu (Cauveri Delta.)

ACTIVITY 11.4

Take a glass bottle and put some leaves, sticks, waste papers and saw- dust in it. Pour water as shown in the figure and keep it for 20 days. Then open the bottle and bring a glowing splinter near the mouth. You can see the natural gas coming out.

The splinter catches fire and burns.



CNG and LNG

1. CNG (Compressed Natural Gas)
2. LNG (Liquified Natural Gas)

CNG is stored at high pressure whereas LNG is in ultra cold liquid form. CNG can be produced at lower cost.

Advantages and uses of CNG

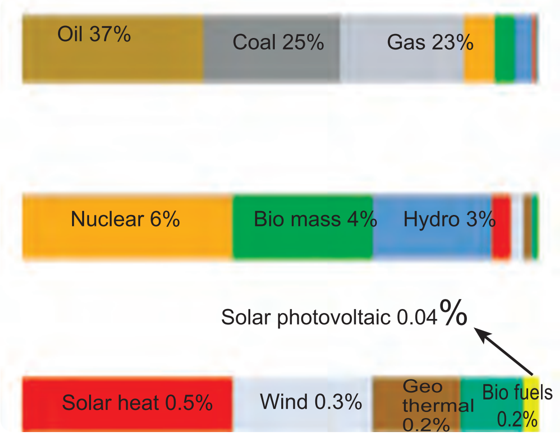
1. It is a less pollutant fuel.
2. It is directly used for burning at home and factories.
3. It is the starting material for the manufacturing of a number of chemicals and fertilisers.

11.4. NATURAL RESOURCES AND LIMITATION

The natural resources in the world have been consumed by man in a rapid way and so very soon all our exhaustible sources like coal, petroleum and gas would soon be reduced to zero level.

Natural Resources	Lasting period
Coal	148 years
Petroleum	40 years
Natural Gas	61 years

So we need to find new alternative sources of energy. Already, energy from natural resources like sun, wind and water are consistently being harnessed.



Not for fun

My father rode on a cart.

I drive a car.

My son flies a jet plane. His son will ride on a cart

Alternative sources of energy

1. Biodiesel : Biodiesel is a fuel derived from vegetable oils such as Soyabean oil, Jatropha oil, Cornoil, Sunflower Oil, Cotton seed oil, Rice bran oil and Rubber seed oil.

2. Wind Mills : All of us know about wind mills. They have long blades connected to a dynamo. When wind blows, they rotate and current is produced in the dynamo. Wind mills are mostly located at Kayathar, Aralvaimozhi, Palladam and kudimangalam in TamilNadu.

3. Solar Energy : Sun is the foremost energy source that makes life possible on our earth.Solar energy has been used by man from ancient time itself. Solar energy is harnessed using (i) solar cookers (ii) solarwater heaters and (iii) solar cells.

11.5. SCIENCE TODAY

1. Hydrogen - The future fuel

Hydrogen could be the best alternative fuel. It is a clean fuel as it gives out only water while burning. Moreover, it has the highest energy content.

2. Cold Fusion Process

Cold fusion is a process in which two one more lighter nuclei of atoms are combined to produce nuclear energy. This process requires very high temperature. In cold fusion, the same process is carried out at room temperature.

3. Methane from sewage

Sewage sludge can be decomposed by microorganisms to produce methane gas along with impurities carbon dioxide and hydrogen sulphide. After removing these impurities, methane gas can be used as an efficient fuel.

MORE TO KNOW

In india, the Petroleum Conservation Research Association(PCRA) advises people how to save petrol/diesel while driving. Their tips are

- Drive at a constant and moderate speed as far as possible.
- Switch off the engine at traffic lights or a t a place where you have to wait.
- Ensure correct tyre pressure.
- Ensure regular maintenance of the vehicle.

"Today's wastage - tomorrow's shortage"

"A mile we walk
we save a litre of petrol
and
a day of life"

EVALUATION

1. Ramu's family cooks food using LPG gas. But Murugan's family cooks food slower. What could be the reason?

2. Fill in the blanks

    a. Coal – Coal gas
    b. Petroleum – ____________
    c. LPG – Propane and Butane
    d. Natural gas – ____________
    e. Diesel – Petroleum
    f. Bio diesel – ____________

3. At present we use petroleum in huge quantities.If we consume petroleum in this rate, in the year 2200 there would be no petroleum at all. Find the alternative. sources of energy and actions to be taken.

4. Read the following tabular column carefully and decide which fuel you should use for cooking.

Wood	L.P. Gas
Smoke is produced	Smoke is not produced
Has low calorific value	Has high calorific value
It takes long time to cook	It takes less time to cook
Ashes are formed	Ashes are not formed

5. Read the following fuels carefully and write the fuels which pollute the environment and which do not pollute.

    1. Coal, petrol, diesel, natural gas, liquefied petroleum gas (LPG) , compressed natural gas (CNG), wood, liquefied natural gas (LNG), kerosene.
    2. Coal, petrol, diesel and LPG are the fuels used by us now. If they are harnessed completely we would be running short of fuels for cooking and using vehicles and working of factories in near future. So we need alternative sources of energy. Being young scientists find the alternative energy in the below circle.

3. Make a list of fuels used by us now
    1. We live in a tropical country. Fossil fuels are fast depleting. name some future fuels.
    2. Students! Types of coal and % of carbon in each type is given below. Which coal should be used to get high calorific value?

Lignite	-	25 to 35% C
Bitumen	-	45 to 86% C
Anthracite	-	87 to 97% C

6. Fill in the blanks

1. ____________ gas is responsible for the burning of fuels.
2. Fossil fuels are mainly made up of ________, __________, and __________.
3. The expansion of L.P.G. is _____________________.
4. ______________method is adapted to get bio--diesel from algae.
5. India ranks __________ among the coal producing countries.
6. The expansion of CNG is______________________.
7. The chief element in coal is ___________.
8. ____________state has the largest coal reserve in India.
9. India exports coal to ______________ country.
10. Solar Cells convert solar energy into ___________ energy.

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Websites

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CHAPTER 12

MEASUREMENTS

12. MEASUREMENTS

In a warm summer vacation, Aruna is eagerly waiting for her friend Swathi. Finally, Swathi came to Aruna's home with an umbrella .

Aruna: Is it raining, Swathi?

Swathi: No Aruna, but my mother asked me to take this, as it is very hot outside.

Aruna: Of course, I heard in the TV news that the temperature was $42^{0}C$ yesterday and it seems to be more than that today.

Swathi: I am confused about the unit that we use for temperature. We see people using celcius but my brother said this morning that kelvin is the unit for temperature.

Aruna: we will clear this doubt with my father (who is a teacher). (They go to Aruna's father for clarification. Aruna's father explained them clearly about units).

You know that measurement is nothing but comparing an unknown quantity with a standard quantity. The standard quantity is called unit. For example, if ,you say a distance as 300km, here 300 is its magnitude and km is its unit. we can't measure anything without a unit.

We have been following many system of units to measure physical quantities. For example kilometre, mile, foot, centimetre etc., are all units of length. Similarly kilogram, gram, pound etc., are units of mass.

Le Systeme International d' Unites (SI system of units)

To bring uniformity, the general conference on Weights and measures in 1971, decided to have an uniform system of measurement called SI system of units. In SI system, the units for all physical quantities are fixed and derived. This is logically far superior to all the other systems. It has certain features, they are based on the properties of atom. So, they do not vary with time. SI system is more convenient to practice.

There are seven fundamental quantities and twenty two derived quantities in this system of units.

We know about the units of length, mass and time in SI system. Let us learn more about other basic units.

Temperature

Kelvin is the primary unit of temperature in SI system. The Kelvin is the fraction of 1/273.16 of the thermodynamic temperature of the triple point of water. (Triple point of water is the temperature at which saturated water vapour, pure water and melting ice are all in equilibrium).

Quantity	SI Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	S
Temperature	kelvin	K
Electric Current	ampere	A
Amount of substance	mole	mol
Luminous Intensity	candela	cd

The freezing point of water is 0ºC in celcius scale but at 0ºC, water molecules do not come to rest. Only at -273ºC, the molecules come to rest. This -273ºC is called absolute zero and it is taken as null point for kelvin scale.

Hence -273ºC.=0K

273K = 0ºC

The usage of negative values in celcius scale can be avoided by using kelvin scale.

Electric current

Ampere is the SI unit for electric current. The ampere is the constant current which, flowing through two straight parallel infinitely long conductors of negligible cross-section and placed in vaccum 1m apart would produce between the conductors a force of 2×10^{-7} newton per unit length of the conductors

Amount of Substance

Mole is the SI unit for amount of substance. A mole is the amount which contains as many elementary entities(atoms,molecules,ions) as there are atoms in 0.012 kg of carbon-12.

Luminous intensity

Candela is the SI unit for luminous intensity. The Candela is the luminous intensity in a given direction due to a source, which emits monochromatic radiation of frequency 540×10^{12} Hz and of which the radiant intensity in that direction is 1/683 watt per steradian.

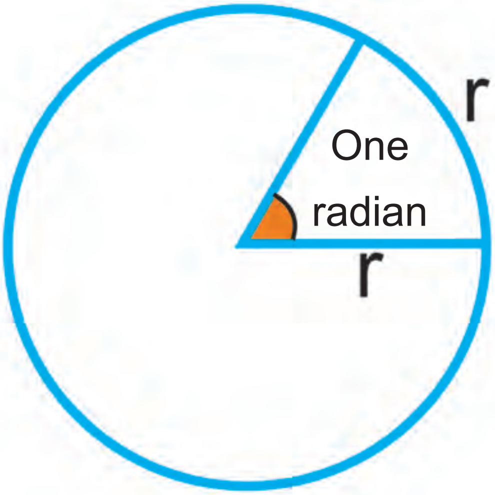
A common candle emits light with a luminous intensity roughly equal to one candela.

Plane angle and Solid angle

Plane angle and solid angle are supplementary quantities till the year 1995. Now they are derived quantities.

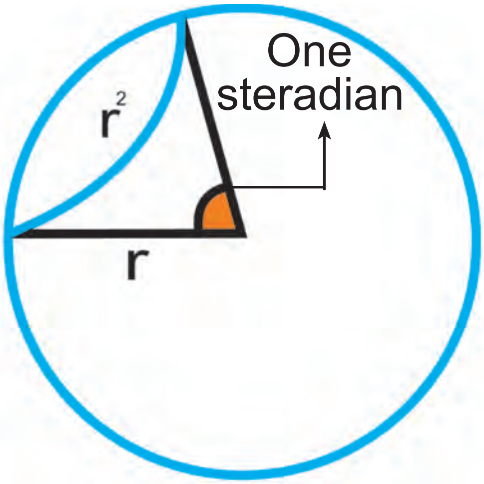
Radian is the SI unit of plane angle.

An angle of one radian results in an arc with a length equal to the radius of the circle.



Steradian is the SI unit of solid angle.

The solid angle subtented at the centre of a sphere of radius r by a portion of the surface of the sphere whose area A, equals r^2.



Conventions to be followed in writing the units in SI system

- The symbols for units should be written with a small letter
- For example: m for metre, kg for kilogram
- Units which are named after scientists should always be written with small letter.
- For example: newton, joule
- The symbols of the units named after scientist should be written by capital letter
- For example: N for newton, W for watt
- Symbols should not be written in plurals but in words,plurals are used.
- For example: 30 kg or 30 kilograms
- There should be no full stop at the end of a symbol for units
- For example: Symbol for unit of length is m(it is not m.)

MORE TO KNOW

1. The intensity of sound is measured in a logarithmic unit called decibel (dB).
2. Intensity of earthquakes are measured in Ricter scale.
3. Very long distances (Distance between Stars and Planets) are measured in Astronomical Unit.

PHYSICS

Units of Length

10 millimetres (mm)	= 1 centimetre (cm)
10 centimetres	= 1 decimetre (dm) = 100 millimetres
10 decimetres	= 1 meter (m) = 1000 millimetres
10 metres	= 1 dekametre (dam)
10 dekametres	= 1 hectometre (hm) = 100 metres
10 hectometres	= 1 kilometre (km) = 1000 metres

Units of Area

100 square millimetres (mm2)	= 1 square centimetre (cm2)
100 square centimetres	= 1 square decimetre (dm2)
100 square decimetres	= 1 square metre (m2)
100 square metres	= 1 square dekametre (dam2) = 1 are
100 square dekametres	= 1 square hectometre (hm2) = 1 hectare (ha)
100 square hectometres	= 1 square kilometre (km^2)

Units of Liquid Volume

10 millilitres (mL)	= 1 centilitre (cL)
10 centilitres	= 1 decilitre (dL) = 100 millilitres
10 decilitres	= 1 litre1 = 1000 millilitres
10 litres	= 1 dekalitre (daL)
10 dekalitres	= 1 hectolitre (hL) = 100 litres
10 hectolitres	= 1 kilolitre (kL) = 1000 litres

Units of Volume

1000 cubic millimetres (mm^3)	= 1 cubic centimetre (cm^3)
1000 cubic centimetres	= 1 cubic decimetre (dm^3)
	= 1 000 000 cubic millimetres
1000 cubic decimetres	= 1 cubic metre (m^3)
	= 1 000 000 cubic centimetres
	= 1 000 000 000 cubic millimetres

Units of Mass

10 milligrams (mg)	= 1 centigram (cg)
10 centigrams	= 1 decigram (dg) = 100 milligrams
10 decigrams	= 1 gram (g) = 1000 milligrams
10 grams	= 1 dekagram (dag)
10 dekagrams	= 1 hectogram (hg) = 100 grams
10 hectograms	= 1 kilogram (kg) = 1000 grams
1000 kilograms	= 1 megagram (Mg) or 1 metric ton(t)

EVALUATION

1. Ramu and Madhu are friends. They wanted to measure the length of a room. Ramu wanted to measure it in foot. But Madhu wanted to mesure it in metres. Who is right in measuring the room in the inernationally accepted system.

2. Match the following

S.No	Quantities	SI Unit
1	Temperature	Candela
2	Amount of Substance	Kelvin
3	Luminous Intensity	Kilogram
4	Mass	Radian
5	Plane angle	Mole

3. Which of the following statement is correct?

    a. The unit of force is Newton

    b. The unit of force is newton

4. Murugan measured the electric current. What unit should he use?

5. Say true or false.

    a. The symbol for units should be written with a small letter.

    b. There should be a full stop at the end of a symbol for units.

    c. We should not use plurals when we write the unit in words.

    d. The SI unit for solid angle is Radian.

FURTHER REFERENCE

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2. The Physics Quick reference guide - E.Richard Cohen 1996 - American Institute of Physics.

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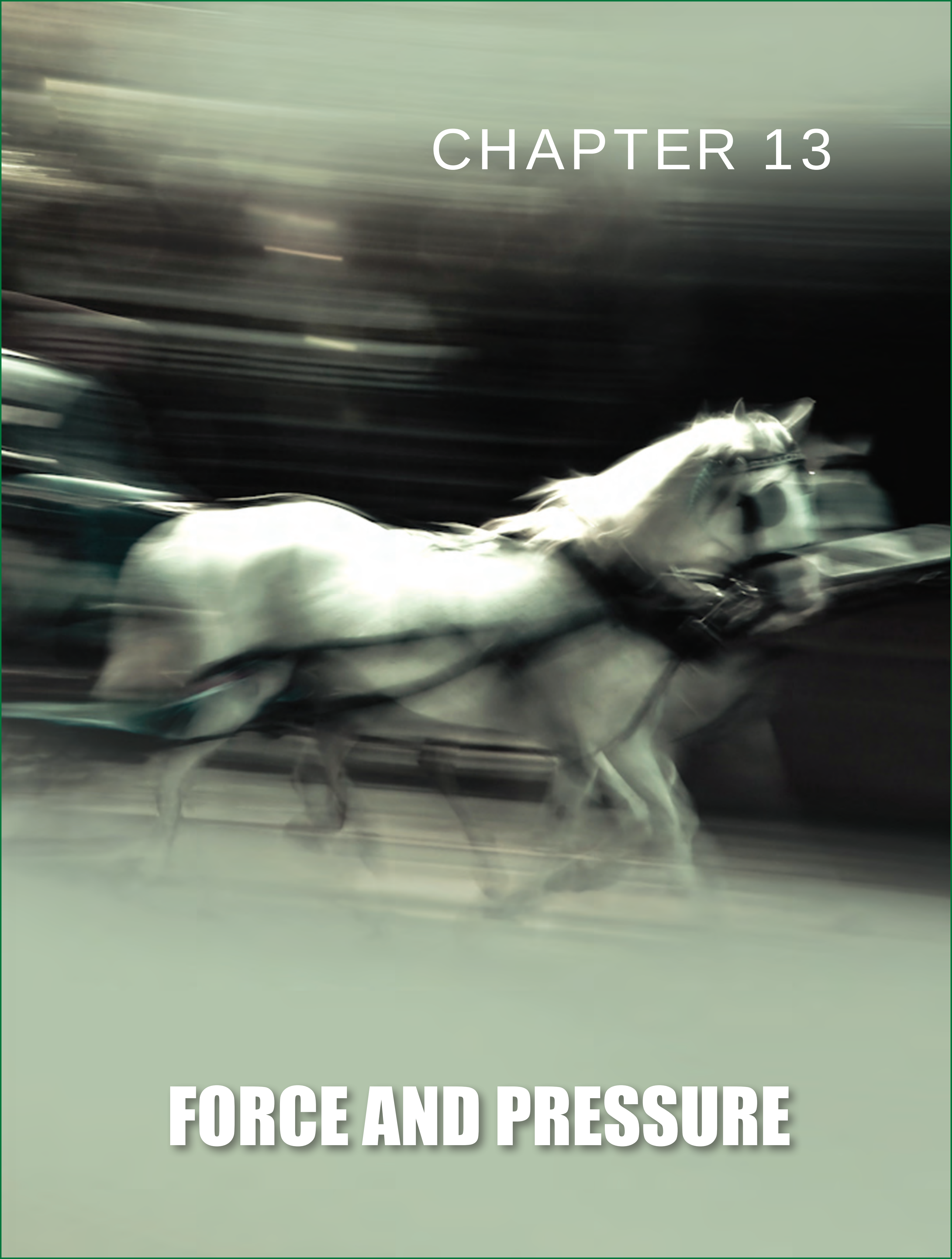
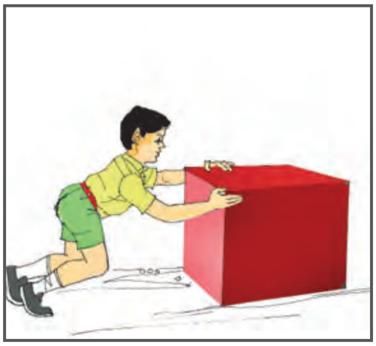
CHAPTER 13



FORCE AND PRESSURE

13. FORCE AND PRESSURE

Murugan and Nila are students of 8th standard. In their day to day life the following activities take place.



Actions like opening, lifting, kicking, pulling, pushing are some of the tasks we do every day. All these actions result in the change of position of an object.

Do you notice that each of these activities involve a push or a pull? From this we infer that to move any object, effort is needed (push or pull). This effort is called a force.

Force is a push or a pull acting on an object which changes or tends to change the state of the object.

UNIT OF FORCE

In the international system of units (SI System), the unit of force is newton (N).

Sir Issac Newton (1642 - 1727)
One of the greatest scientists the world has ever seen. He was an English mathematician, physicst and astronomer. The SI unit of force is named after him.

MORE TO KNOW

There are also other units that are used to measure force. They are dyne, kilogram weight and pound.

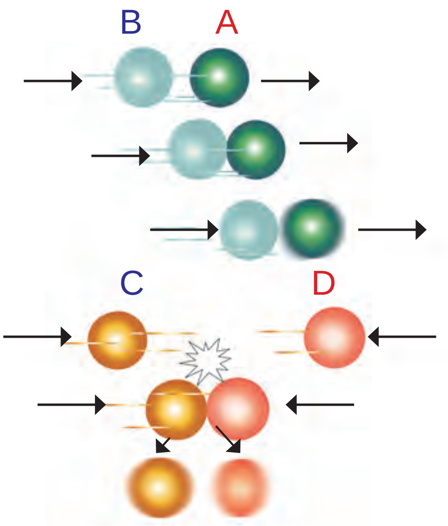
13.1. STATE OF MOTION

Let us play a game with marbles to understand what happens when force acts on an object.

Set a marble A in motion. Hit it from behind with another marble B. What do you notice?

The marble A moves faster. It is because the marble B exerted a force on A.

Take two more marbles C and D. Let them move in the opposite direction and collide with each other. After the collision, the marbles C and D change their directions of motion as shown in the figure. This is due to the exertion of force between them.



Hence a force changes either the speed of an object or its direction of motion.

A change in either the speed of an object or its direction of motion or both is described as a change in its state of motion. Thus, a force may bring a change in the state of motion of an object.

A force does not always result in a change in the state of motion. For example, the wall of a room may not move at all even if we apply the maximum force that we can exert. This does not mean that we are not applying force, but the force that we are applying is not sufficient to move the wall.

ACTIVITY 13.1

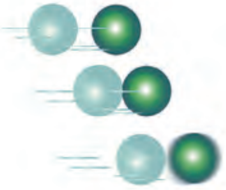
Ask your friend to bowl a cricket ball towards you. Hit the ball with a cricket bat. What happens to the state of motion of the ball?

13.2. ACTION OF FORCE AND ITS EFFECTS

ACTIVITY 13.2

Some situations have been given in the column 1 of the table; column 2 shows diagrams of some actions. Match the situation in column 1 with suitable diagram in column 2.

Table

Column 1	Column 2
Moving an object which is at rest	
Changing the speed of an already moving object.	
Changing the direction of motion of an object	
Changing the shape of an object	

From the above activity, you would have realised that a force

- can move an object from rest.
- may change the speed of an object if it is already moving.
- may change the direction of motion of an object.
- may bring about a change in the shape of an object.
- may cause some or all of these effects.

It is important to note that none of these actions is possible without the action of a force.

13.3. CONTACT FORCES

Can you lift a pot of water without holding it? Can you push this table without touching it?

Generally, to apply force on an object, we need to come in contact

with that object. A force that can cause or change the motion of an object by touching it is called **Contact Force.**

In the above activities, the force is caused by the action of muscles. Hence this force is known as Muscular force. Do you agree that muscular force is a contact force?

Are there other types of contact forces? Come, let us find out.

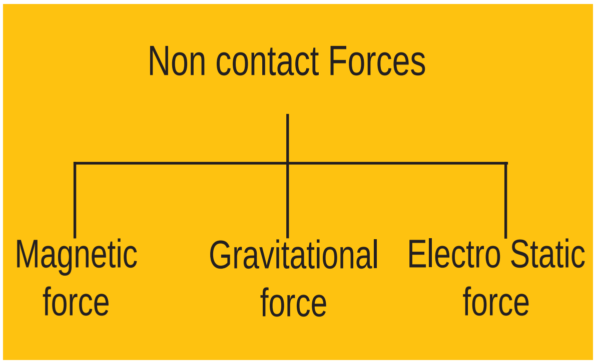
A ball rolling on the play ground gradually slows down and comes to rest. If the ground is made smooth, the distance covered by the ball would be more than that what was covered earlier. Why?

The ball slows down due to the force acting between the ball and the ground. It is the force of friction which causes the ball to rest. The frictional force is always in a direction opposite to the direction of motion of the object.

The force of friction arises due to contact between the ball and ground. It acts between any two bodies when both are in contact with each other and either any one or both are moving. Is friction also a contact force? Yes.

13.4. NON-CONTACT FORCES

A non-contact force is any force applied to an object by another body without any contact.

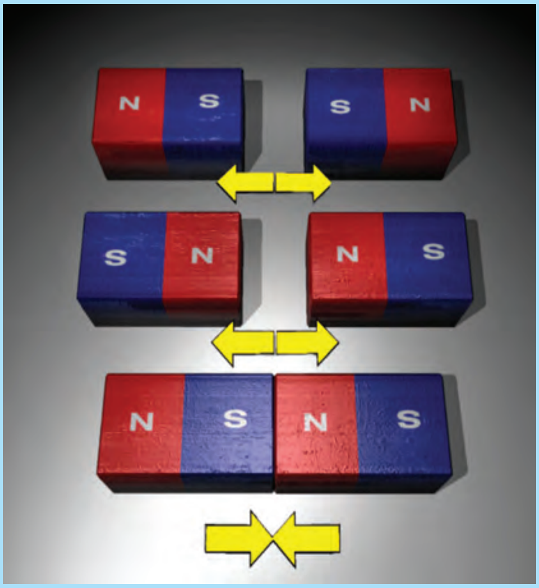


13.4.1. Magnetic Forces

ACTIVITY 13.3

Take a pair of bar magnets. Place one of the magnets on a smooth surface such as a table. Now bring one end of the other magnet to one end of the magnet on the table and observe what happens.

Next, separate the two magnets, and bring the other end of the magnet you are holding to the same end of the magnet on the table. Again, watch what happens.



Is it necessary to bring the two magnets in contact to observe the force between them? No. A magnet can exert a force on another magnet

without touching it. Magnetic force is a non contact force.

13.4.2. Gravitational Force

Have you wondered why the ball hit for a six by a batsman comes back to the ground? Or why a mango or an apple falls to the ground? Why are objects fall towards the earth? It is because the earth pulls them down. This force is called the **force of gravity**. This is an attractive force. This is an example for non-contact force.

MORE TO KNOW

Gravity is not a property of the earth alone. In fact, every object in the universe whether small or large, exerts a force on every other object. This force is also known as the gravitational force.

13.4.3. Electrostatic Force

ACTIVITY 13.4

When you switch off the Television in your house after watching for some time, you can notice that hairs in your hands are getting attracted towards the screen. Why?

The television screen becomes electrically charged and it exerts an electrostatic force on the hair of your hand. This force is a non-contact force because, there is no contact between the screen and the hair.

The force exerted by a charged body on another charged or uncharged body is known as electrostatic force. This force acts when the bodies are not in contact. The electrostatic force is another example of non contact force.

PHYSICS

13.5. PRESSURE

ACTIVITY 13.5

Take two bags of the same size. Let the strap of one bag be narrow and that of the other broad.

Place your books in the bag with broad strap. Hang the bag on your shoulder and walk for some time. How do you feel?

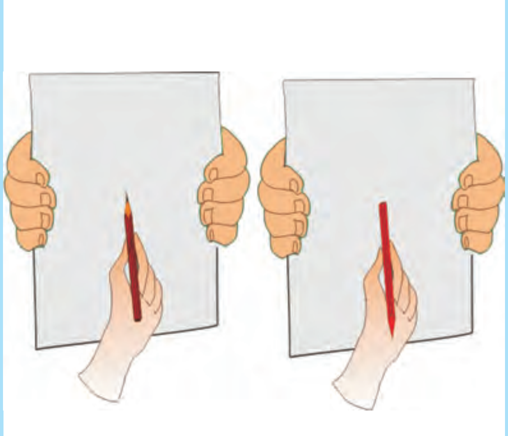
Transfer the books to the other bag with narrow strap. Hang it again on your shoulder and walk for some time. How do you feel?

It is comfortable to carry the bag with broad strap. Isn't it? Why?

when you hang a bag with broad strap, the weight of the books is distributed over a larger area of the shoulders and hence the pressure on your shoulders is less.

ACTIVITY 13.6

Let us take a pencil and a paper. Try to make a hole in the paper by pressing the blunt end of the pencil on the paper.



Now try to make a hole in the paper by pressing the sharp end of the pencil.

Which was easier why?

Although the force applied on the pencil is almost the same in both the cases, the sharp end of the pencil is able to make a hole. In this case the area over which the force acts on the paper is very small and its effect on the paper is much greater (it makes a hole in the paper).

From these activities we understand that the effectiveness of the force applied depends on the area on which it is acting.

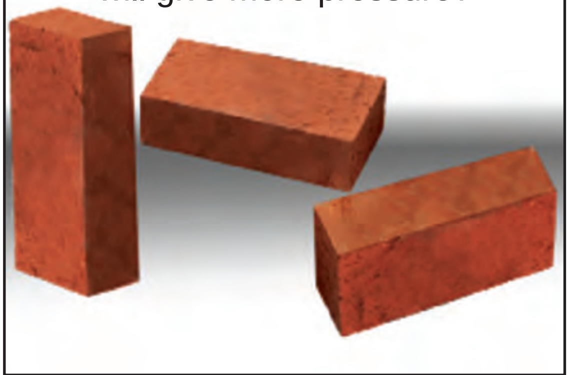
Now we will define a new physical quantity, pressure.

Pressure is defined as the force acting on a unit area

$$\text{Pressure} = \frac{\text{Force}}{\text{Area on which it acts}}$$

The SI unit of pressure is N/m^2. It is also called pascal (Pa) .

Can you say which brick will give more pressure?



Solved Problem 1:

A liquid gives force of 100N over an area of $2m^2$. What is the pressure?

Force = 100N

Area = $2m^2$

Pressure = ?

$$\text{Pressure} = \frac{\text{Force}}{\text{Area on which it acts}}$$

Blaise Pascal (1623-1662)

One of the greatest scientists of the 17th century. He was a child prodigy. A French mathematician, physicst,inventor, writer and philosophor. The SI unit of pressure is named after him.

Substituting the values

Pressure = $100N / 2m^2$

= $50 N/m^2$

Pressure = $50 N/m^2$

TRY YOURSELF

A liquid's force is acting over an area of $4m^2$. If the pressure is $25 N/m^2$, what is the force?

13.6. PRESSURE EXERTED BY LIQUIDS AND GASES

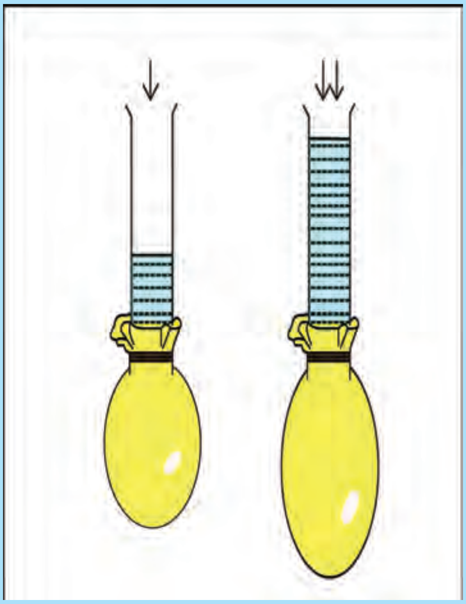
You know that liquids and gases are called fluids. Solids always exert pressure downwards. But the fluids exert pressure in all directions.

Fluids exert pressure on all bodies immersed in them and also on the walls of the container that holds them.

Pressure exerted by Liquids

ACTIVITY 13.7

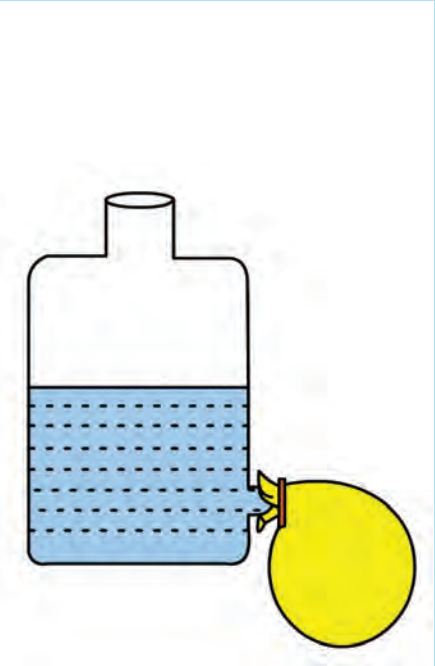
Take a transparent glass tube or a plastic pipe. Also take a piece of thin good quality of rubber (Piece of a rubber balloon). Stretch the rubber sheet tightly over one end of the pipe. Hold the pipe vertically. Ask one of your friends to pour some water in the pipe. Does the rubber balloon bulge out? Notice the height of the water column in the pipe. Pour some more water. Observe again the bulging in the rubber baloon and the height of the water column in the pipe.



This shows that the pressure exerted by liquids at the bottom depends on the height of the liquid column.

ACTIVITY 13.8

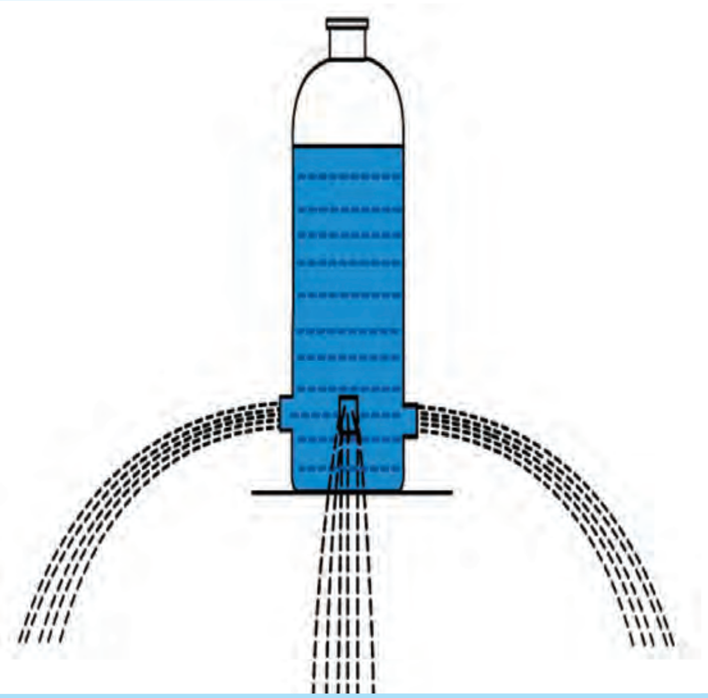
Take a discarded plastic water bottle, fit a glass tube near the bottom of the bottle. You can do so by slightly heating one end of the glass tube and then quickly inserting it. Make sure that the water does not leak from the joint. Cover the mouth of the glass tube with thin rubber baloon as you did in Activity 1. Now fill the bottle with water up to half of the bottle. What do you observe? Why does the rubber sheet bulge this time? Now pour more water and watch, what happens to the rubber sheet?



This shows that liquid exerts pressure on the walls of the container.

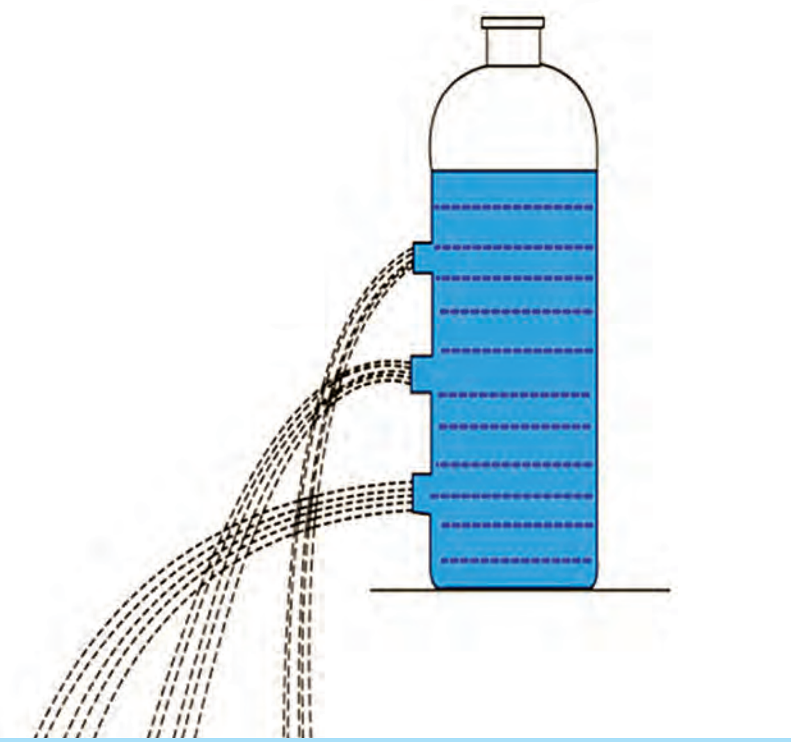
ACTIVITY 13.9

Take a plastic bottle and drill four holes all around near the bottom of the bottle. Make sure that the holes are at the same height from the bottom. Now fill the bottle with water. What do you notice? Do the different streams of water coming out of the holes fall at the same distance from the bottle?



Inference: Liquid exerts equal pressure at the same depth.

ACTIVITY 13.10



Take a plastic bottle, drill three holes at different heights from the bottom. Now fill the bottle with water. What do you observe? You can see that three different streams of water fall at different distances from the bottle.

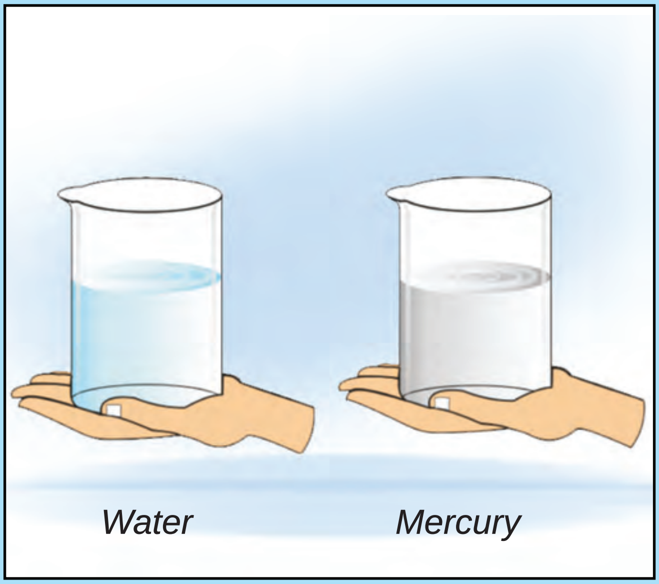
Inference: The pressure of the liquid increases with the increase in depth.

PHYSICS

ACTIVITY 13.11

Let us take two identical glass beakers. Take some water in one beaker and an equal amount of mercury or caster oil in other beaker.

Let us approximately find out which beaker is heavier by keeping both the beakers on our palms.



Is the pressure exerted by both the beakers same?

No, the pressure is different. The pressure exerted by the beaker containing mercury or caster oil is more than that of the beaker containing water. This is because mercury or caster oil has more density than water.

Hence we can infer that pressure depends on density of a liquid.

Is the pressure exerted by a glass of water the same on the earth and the moon?

No, on the earth we have more gravitational force and hence the pressure exerted by the glass of water will be more.

On the moon, the gravitational force is less compared to our earth. Hence the pressure exerted by a glass of water is less on the moon.

So, pressure of a liquid depends on gravitational force (g).

The pressure of a liquid can also be calculated by using a formula

$p = hdg$

p = pressure of a liquid
h = height of the liquid column
d = density of the liquid
g = gravitational force

MORE TO KNOW

- Deep sea divers wear specially designed suits to protect them from the huge pressure of the water underneath.
- The walls of the dams are made stronger and thicker at the bottom than at the top of the dam to withstand the huge lateral pressure of water at the bottom

ACTIVITY 13.12

Take three kinds of vessels as shown in figure. Make holes in them at the same height from the bottom. Pour water into the vessels so that the height of the water level is same in all the vessels. Observe in which case the pressure is more.

13.7. PRESSURE EXERTED BY AIR

We must have walked on the road while there is a strong wind. How did we feel? Did we feel any force while walking against the wind?

What happens to the bicycle tube when it has a puncture?

From the above observations you can say that gases also exert pressure on the walls of their container.

13.8. ATMOSPHERIC PRESSURE

The earth is surrounded by air all around. This thick envelope of air is called the atmosphere. The atmospheric air extends up to many kilometers above the surface of the earth. The pressure exerted by this air column is known as the atmospheric pressure.

We know pressure is force per unit area, and if we imagine a unit area and a very long cylinder standing on it filled with air, up to the height of atmosphere, then the weight of the air in this cylinder is atmospheric pressure.

The atmospheric pressure at sea level is approximately 1,00,000 N/m^2 or (10^5 N/m^2). As we go higher and higher above the earth surface, the atmospheric pressure decreases.

MORE TO KNOW

Why do astronauts wear a special dress to go into the space?

The blood pressure inside our body would need air pressure outside to keep us safe.

When we go above the earth's atmosphere, the pressure outside is very less. But, the pressure inside our body is very high. Due to this our body will burst. So, to avoid this astronauts wear a special dress.

PHYSICS

Measurement of atmospheric pressure

The atmospheric pressure is not the same at all places. It decreases as we go above the earth's surface. The instrument used to measure the atmospheric pressure is called Barometer.

In 1643, an Italian scientist named Torricelli invented the first barometer. It was a mercury barometer. Aneroid barometer and Fortein's barometer are other instruments used to measure the atmospheric pressure.

ACTIVITY 13.13

Take a glass of water. Suck a little water through a straw. Hold your finger above the straw. Pull the straw out of the water. What do you observe? Now remove your finger from the top of the straw. what happens?

ACTIVITY 13.14

Take an ink - filler. Press its bottom with your finger to Pump air out of it. Now keep its open end in water or ink and release your finger. What happens now?

ACTIVITY 13.15

Take a rubber ball and make many holes in it with a needle. Fill the ball with water. Squeeze the ball with your hand. What do you see?

Water rushes out through the holes with equal forces. What do you infer from this?

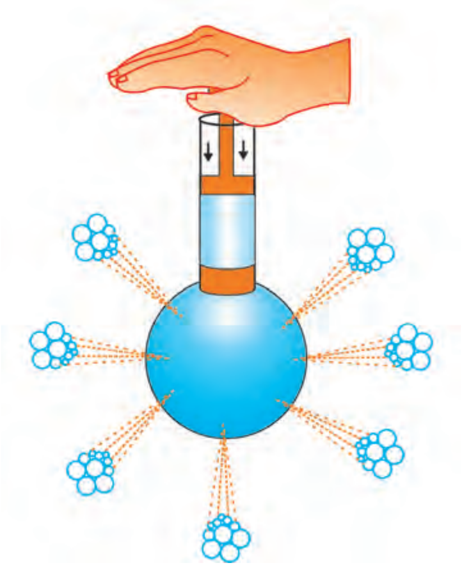
13.9. PASCAL'S LAW

The pressure applied to an enclosed liquid gets transmitted equally to every part of the liquid. This property was first demonstrated by Pascal and is called Pascal's law.

Hydraulic devices, like earth excavators (JCB) and car brakes work on the above principle.

Take a stout flask with holes of equal size at different places as shown in the figure. Fit a piston which can be moved up and down along the neck of the flask. When a force is applied on the piston, the piston moves down and the water flows

out equally in all directions through the holes. This shows pressure exerted on water is transmitted equally throughout the water so that water comes out of all the holes with equal force.



13.10. FRICTION

We must have seen children skating. These children wear shoes with wheels. Is it possible to skate on bare feet?

The force which opposes the action of sliding your foot on the floor is called 'friction'.

We saw earlier that the frictional force is a contact force.

Friction is the force created whenever two surfaces move or try to move over each other.

Friction is caused by the irregularities on the two surfaces in contact. Even those surfaces which appear very smooth have a large number of irregularities on them. Irregularities on the two surfaces lock into one another. When we attempt to move any surface, we have to apply a force to overcome the interlocking. On rough surfaces there are larger number of irregularities. So the force of friction is greater if a rough surface is involved.

13.10.1. Factors affecting friction

The force of friction depends on two main factors

1. Mass of the body

2. Nature of the surfaces in contact

As the mass of the body increases, the force of friction also increases. A football goes farther than a cricket cork ball on a kick, since the mass of the cricket ball is more than that of a foot ball.

Friction is less when the surface is smooth. This you can

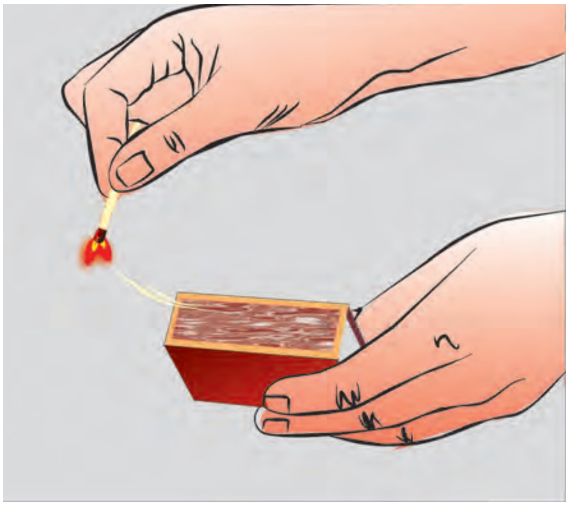
understand by rolling a stone on a tar road(rough surface) and a house floor(smooth surface).

13.10.2. Friction a necessary evil

Friction plays, an important role in our daily life. Friction opposes motion and so you may think it is an evil. But it is a necessary evil. Let us see why?

Friction is necessary

1. We are able to walk or run properly on the floor because of friction. If there is less or no friction we will slip and fall down.
2. It would not be possible to light a match stick without friction between its head and the side of the matchbox.
3. Cars and buses are able to run on the roads because of the friction between the wheels and the road.
4. We cannot write on paper without friction between the tip of a pen or a pencil and the paper.



Friction as an evil

1. Friction produces heat. This heat causes wear and tear of the machinery parts.
2. Vehicle tyres and soles of footwear wear out because of friction.

13.10.3. Increasing and reducing friction

We have seen in the earlier section that friction is desirable in some situations. Can we increase this friction?

You may have seen that the sole of shoes and footwear are grooved. Why is it so? Have you ever thought of it?

It is done to provide them better grip on the floor, so that you can move safely. This means you have increased the friction.

The treaded tyres of cars, trucks and bulldozers provide better grip with the ground.

Sand and gravel are strewn on the slippery ground during rainy season to increase the friction.

Just as we can increase the friction, we can also reduce the friction.

Friction can be reduced

1. By using suitable lubricants, friction can be reduced. eg. oil (for light machinery), grease (for heavy machinery) ,
2. If the rubbing surfaces are polished, they become smooth and in turn, reduce friction between them.
3. By the use of wheels .

4. By the use of ball bearings.

Ball bearings have small balls of steel between metal surfaces. They are placed between hubs and the axles of ceiling fans, bicycles, motor cycles etc. to reduce friction.

Ball bearing

MORE TO KNOW

Friction can never be entirely eliminated. No surface is perfectly smooth. There are always some irregularities.

EVALUATION

1. Choose the correct answer.

a) The SI unit of pressure is N/m^2.This unit is otherwise called -----------(pascal, newton, joule)

b) Atmospheric pressure at sea level is approximately equal to ----------(10^5 N/m^2, 10^7 N/m^2, 10^3 N/m^2)

2. Fill in the blanks

Friction is a-------------- force (contact / non-contact)

3. Match the following

i)	wheels and ball bearings	non-contact force
ii)	grooves	based on Pascal's law
iii)	earth escavators	increases friction
iv)	fall of an apple from the tree	decreases friction

4. Correct the given statement.

The gravitional force of moon is equal to the gravitational force of earth.

5. List out the following actions on the basis of contact force and non contact force

a) lifting a chair

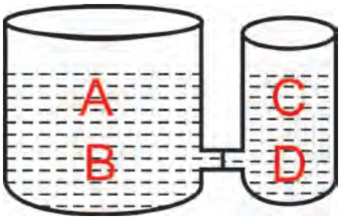
b) the falling of a coconut from the tree

c) friction between the road and the tyre of a car

d) a comb attracts bits of paper

e) attraction between two magnets

6. By observing the diagram, answer the following.



a) How does the pressure at A differ from the pressure at B.?

b) The pressure at B is greater than the pressure at D. Is it true?. Justify your answer.

c) Compare the pressure at A and C.

d) If the water is replaced with mercury, how would this affect the pressure at A and D?

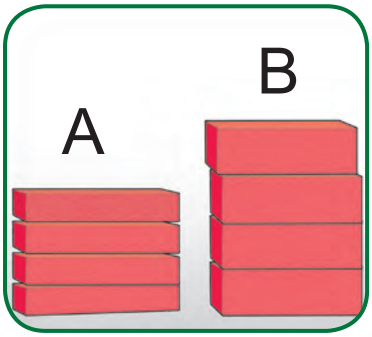
7. We know Pressure = $\frac{\text{Force}}{\text{Area}}$

If 50 N force is applied on a liquid and it experiences 25 N/m^2 pressure. Find out the area on which the force is applied?

8. Aswin and Anwar were playing with four bricks each. Aswin arranged his four bricks as shown in figure A. Anwar arranged his bricks as shown in figure B, in order to be a taller one.

Now let us complete the following sentences by choosing the right option below

(equal to, less than, more than)



a) The force of A on the ground is __________ the force of B on the ground.

b) The area that A occupies is ________ B on the ground.

c) The pressure exerted by A is _______ B

9. We know that pressure can also be calculated by using the formula p=hdg

A rectangular storage tank is filled with paraffin. The height of the tank is 2m. Density of paraffin is 800 kg/m^3, the value of g is 10 N/m^2

Calculate

a) the pressure at the bottom of the tank

b) the pressure at a depth of 1 m.

10. Swetha is wearing a sharp edged high heeled footwear. Madhu is wearing a flat footwear. If both the girls are having same weight and both are stepping over your foot, whose footwear will cause more pain to your foot? Why?

11. Swathi went by car to Ooty last week, when the car was climbing the mountain, her ears popped. She felt uneasy but after sometime she felt better. Why did her ears pop when she climbed the mountain?

12. As we go higher and higher atmospheric pressure _______ (increases / decreases)

PHYSICS

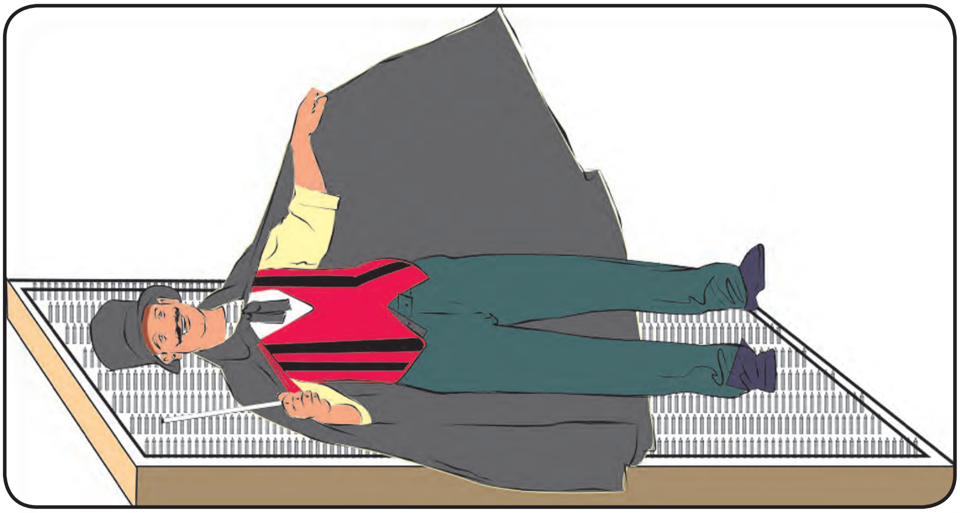
13. Kumaran went to a shop near his house on a bicycle. The bicycle made a lot of noise when he pedaled it. After coming home, he applied some oil on some parts of the bicycle. Now there is no noise, why?

14. We know that friction depends upon mass of the body when we roll down an iron ball and a football on the ground, which ball will travel more distance? Why?

15. When we “suck” on a straw, the liquid travels up in it. Explain why?

16. In a car, friction is essential in some parts but needs to be reduced in some parts. Give two examples of where friction is a) Essential and b) Needs to be reduced in a car.

17. Arasu went to an exhibition. There he saw a magician lying on a bed of nails. To his wonder, the magician was not hurt at all. help Arasu to understand the phenomenon.

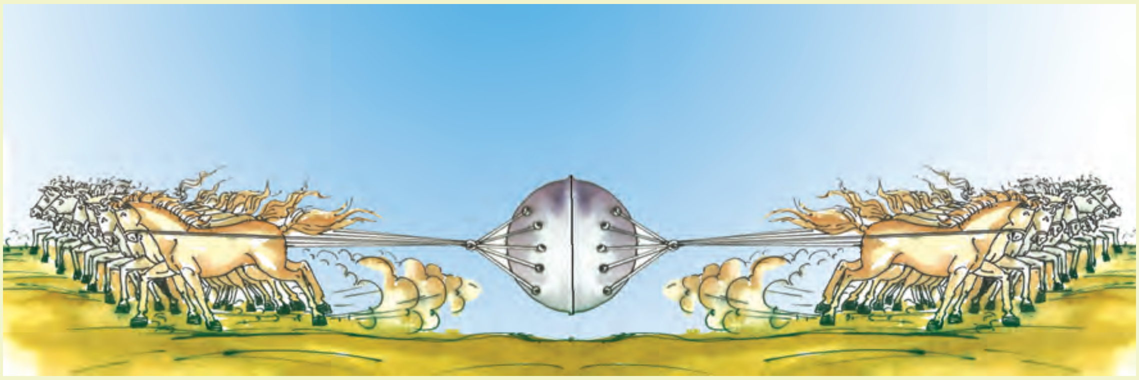


Project Work

Take a brick. Measure its length, breadth and height. Weigh the brick on a balance and note its weight. Now keep the brick on a table in various positions in turn. Find its area of contact with the table. The weight of the brick is the force applied by the brick. Now calculate the pressure applied by the brick on the table in various positions. Prepare a chart showing your observations. Similarly find the pressure exerted by a book, a wooden block, etc., and note your observations in the chart.

DO YOU KNOW?

Otto von Guericke, a german scientist of the 17th century, invented a pump to extract air out of a vessal. With the help of this pump, he demonstrated dramatically the force of the air pressure. He joined two hollow metallic hemispheres of 51cm diameter each and pumped air out of them. then he employed eight horces on each hemispher to pull them apart. So great is the force of air pressure that the hemispheres could not be pulled apart.



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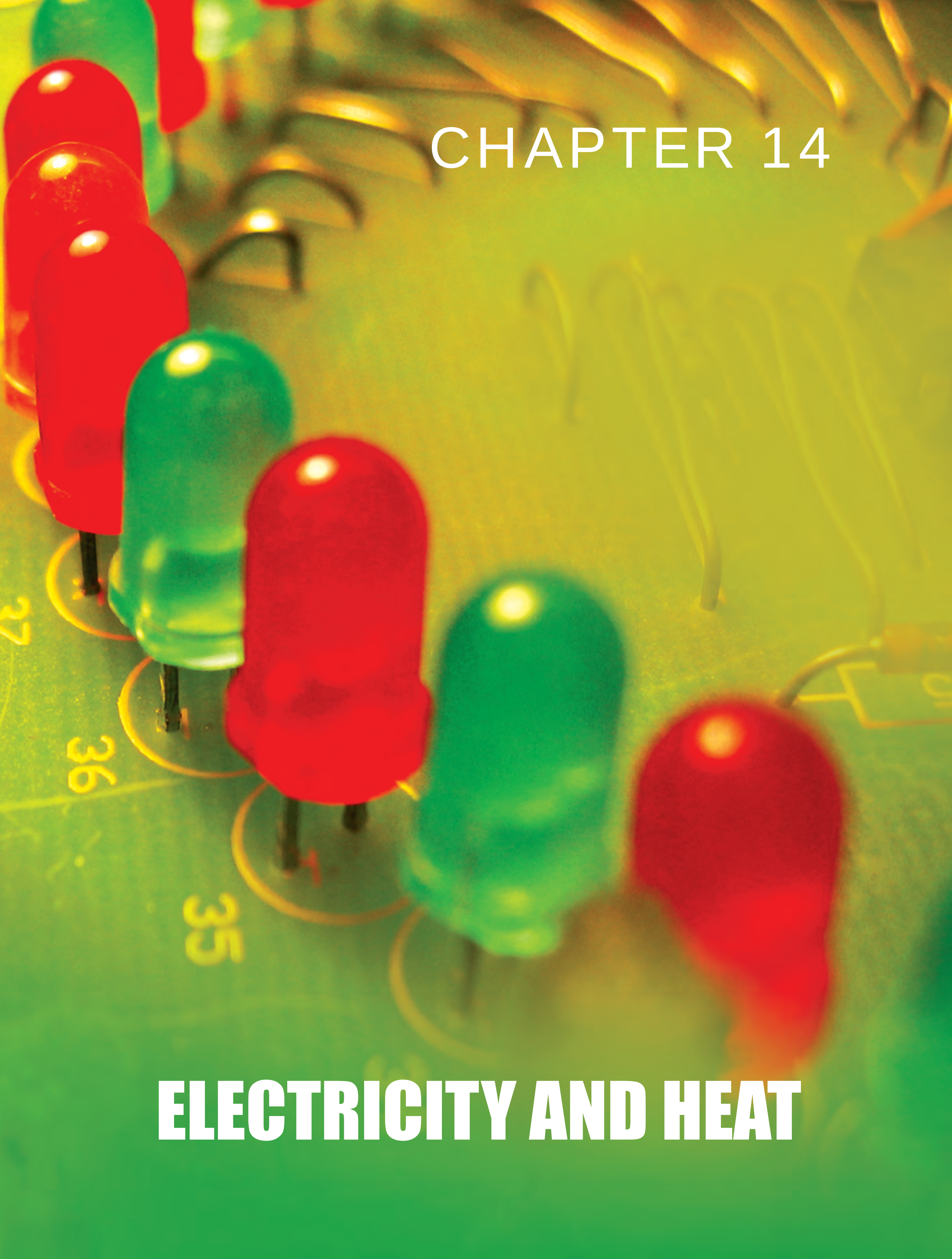
CHAPTER 14

ELECTRICITY AND HEAT



14. ELECTRICITY AND HEAT

Murugan went to Anand's house last Sunday. He rang the calling bell and waited. Anand opened the door and they went inside the house. What murugan saw inside the house is shown in the picture. What do you see in the picture? Can you imagine how their life would be without electricity?

Electricity plays a very important role in our daily life. It is a form of energy that helps us in many ways. Most of the charm of modern life would not be there, if there is no electricity.

MORE TO KNOW

We are often advised to avoid handling electrical appliances with wet hands. Why? Water, with dissolved salts in it, is a good conductor of electricity. Our body is made of 70% water with dissolved substances. That makes us good conductors, too.This is why we should not touch live electric wires with bare hands.

Using rubber gloves and shoes will protect us to a certain extent.

PHYSICS

The electricity that we use in our houses, schools and factories is obtained through power stations. (A power station is a place where electricity is produced in large scale by using various sources of energy like water, wind, heat etc.,). We get a small amount of electricity through batteries and cells.

The electric power thus produced is used through circuits and controlled by switches .

14.1. THREE KINDS OF CIRCUITS

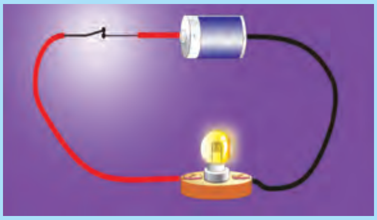
Flow of current requires a closed conducting path. This path is made by connecting a cell or a battery, a switch (key) and a bulb, by means of wires. This closed conducting path is known as an electric circuit. Recall your experience of drawing a circuit with symbols of the components.

Simple circuit

A circuit made up of a cell, a switch and a bulb is known as a simple circuit . When the switch is put on, the bulb glows. This is because there is a continuous or closed path for the electric current to flow.

ACTIVITY 14.1

Take a battery, bulb, switch and wires. Connect them as shown in figure to make a simple circuit.

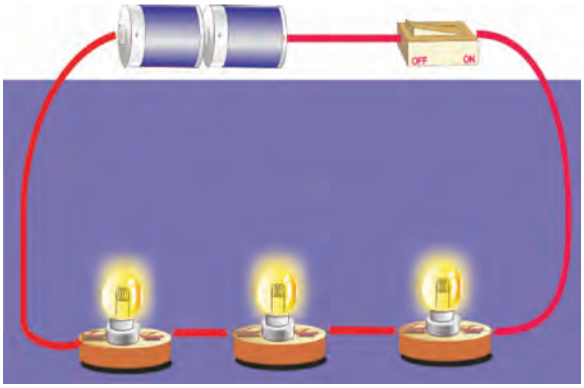


Series and Parallel Circuits

Murugan and Ramu are friends. One day they were discussing about constructing a circuit. They were very eager to construct a circuit with two or more bulbs. They tried and constructed a circuit with three bulbs in two different ways.

Series Circuit

One of the circuits constructed by them is given here. When you look at the circuit, it is obvious that the bulbs are connected end to end. This type of circuit is known as series circuit. Here the current can flow only in one direction and the same amount of electric current flows through all the bulbs.

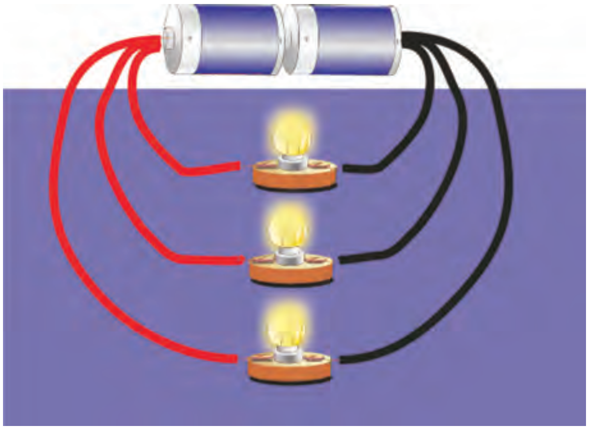


What happens when one of the bulbs in the circuit is removed or fuses off? The other bulbs will not glow because the circuit is not complete now.

Parallel Circuit

Observe the second circuit. here each bulb is connected with the battery terminals, by separate wires. This type of circuit is known as parellel circuit.

In this circuit different amount of current passes through the bulbs.



What happens when one of the bulbs in the circuit is removed or fuses off? The other bulbs will glow because they will have separate conducting paths.

MORE TO KNOW

The electrical appliances of our houses are all connected in a parallel circuit. It is done because only in a parallel circuit every appliance gets current separately. If we switch off any of the appliance, the others will continue to work.

14.2. CONDUCTION OF ELECTRICITY IN LIQUIDS

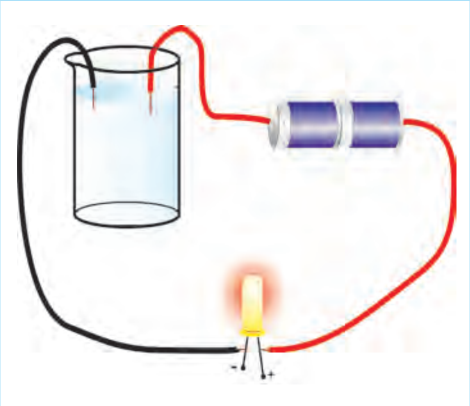
We know that metals like Copper, Aluminium, Iron, Gold, etc., allow electric current to pass through them and they are called conductors.

Materials like Wood, plastic, rubber, glass etc do not allow electric current to pass through them and they are called Insulators.

ACTIVITY 14.2

1.. Draw a series and a parellel circuit with three bulbs in it using only symbols of the components.
2. Draw one series and one parellel circuit diagram with two cells and four bulbs.

ACTIVITY 14. 3



Construct a Circuit using two cells, a LED and connecting wires. Immerse the two free ends of the wires into a beaker containing water or any liquid without touching each other. If the LED glows, the liquid conducts electricity. If the LED does not glow; the liquid does not conduct electricity.

If the brightness of LED glow is high, the liquid is a good conductor. If the LED brightness is low, it means less current is flowing through the liquid. These liquid are known as poor conductors of electricity.

PHYSICS

What about liquids. Do they conduct electricity? Let us verify this by doing an activity.

Repeat the experiment with the following liquids and check their conductivity.

S. No.	Liquid	Good Conductor	Poor Conductor
1.	Common salt solution		
2.	Hydro chloric acid		
3.	Lime juice		
4.	Petrol		

From the above table we find that some liquids are good conductors of electricity and some are poor conductors.

Repeat the experiment to test the conduction of electricity through distilled water. What do you find? Does distilled water (pure water) conduct electricity? No, because it is a poor conductor. When a pinch of salt is dissolved in distilled water, you obtain a salt solution. It becomes a good conductor of electricity.

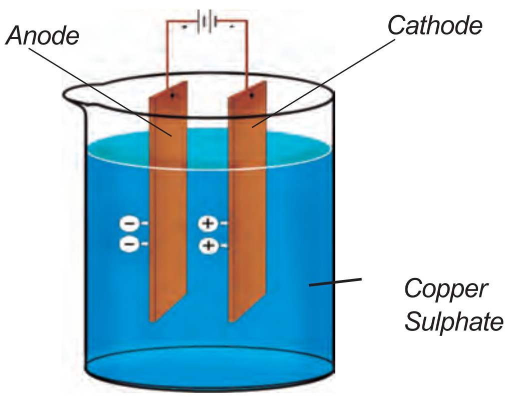
Water we get from sources such as taps, hand pumps, wells and ponds is not pure. It contains a small amount of salts which are naturally present in it. Thus this water is a good conductor of electricity.

Therefore liquid that conduct electricity are solutions of acids, bases and salts. But the conductivity varies from one liquid to another.

14.3. CHEMICAL EFFECTS OF ELECTRIC CURRENT

What happens when current is passed through liquids (solutions)? The current will produce a chemical change when it is passed through solutions. This is known as chemical effect of current.

Let us take copper sulphate solution in a beaker. Immerse two copper plates into the solution. One plate is connected to the positive end of a



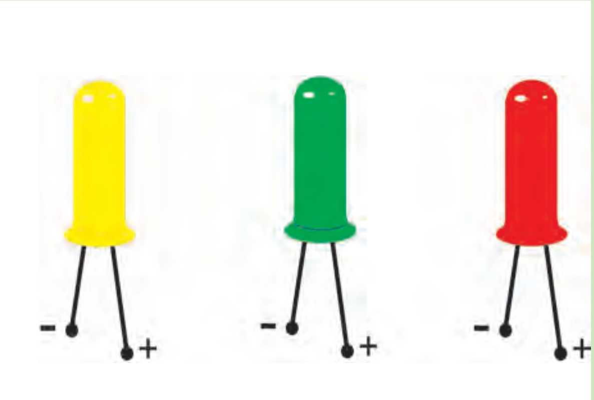
battery (known as anode) and the other plate is connected to the negative end of the battery (known as cathode).

When current passes through the solution, it splits up into positive copper ions and negative sulphate ions. The positive copper ions are

MORE TO KNOW

LIGHT EMITTING DIODE (LED)

An electric bulb is used in the electric circuit to confirm the flow of current in the circuit. However, the electric bulb may not glow if the electric current is weak. So that we use an LED in place of the electric bulb LED is Light Emitting Diode, made up of semiconductor materials. A very small amount of current is sufficient to make and LED glow. LEDs are available in electrical shops. They have two legs, one short and one long. The Short leg is to be connected to the negative terminal and the long leg to the positive terminal. LEDs are available in many colours such as red, green, yellow, blue, white and are increasingly being used for many applications. LEDs are increasingly being used for lighting.



attracted towards the cathode and gets deposited on the cathode. The negative sulphate ions are attracted towards the anode and reacts with copper in the anode converting it into copper sulphate.

This shows that electric current has a chemical effect on copper sulphate and it brings about a chemical change. This process is known as electrolysis.

The two conductors that are immersed in the solution where the current enters and leaves the solution are called **electrodes** (copper plates in the above activity).

A substance which conducts current either as a solution or in the fused state is called an **electrolyte** (copper sulphate solution in the above activity).

The process by which an electrolyte is decomposed with the help of electricity is called as **electrolysis.**

14.4. APPLICATIONS OF CHEMICAL EFFECTS OF ELECTRIC CURRENT

Electroplating is the most common application of the chemical effects of electric current.

14.4.1. Electroplating

Have you ever seen gold plated jewellery (covering jewellery). They are made by electroplating gold on cheaper metals to make it more

attractive? What is electroplating? The process of depositing a thin layer of a metal on any conducting surface by the process of electrolysis is known as **electroplating.**

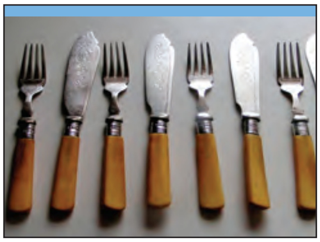
In electroplating the metal to be coated is taken as cathode. The article (metal) to be coated is taken as anode and an appropriate solution is taken as the electrolyte.

Uses of Electroplating

Look at the pictures. What do you find? Electroplating is very useful and widely used in industries. For example chromium plating is employed on many objects like car parts, wheel rims, bath taps. Silver plating is used on tableware and electrical contacts; it has also been used on engine bearings.

MORE TO KNOW

Zinc coated iron is called Galvanized Iron (GI). This iron is used in water taps (GI pipes), since they have high resistance to corrosionUsing rubber gloves and shoes will protect us to a certain extent.



The most extensive use of gold plating is on jewellery and watch cases. Zinc coatings prevent the corrosion of steel articles, while nickel and chromium coated articles are used in automobiles and household appliances.

14.5. ELECTRIC CHARGES AT REST

The most dramatic natural phenomena we observe on earth is lightning. The lightning is an electric spark. We also see sparks on an electric pole when wires become loose. These phenomena are quite common. How do they occur? What is

To be electroplated	Cathode	Anode	Electrolyte
Zinc	Iron	Zinc	Zinc sulphate
Silver	Iron	Silver	Silver nitrate
Gold	Silver	Gold	Gold chloride

Silver Ring (before and after Gold Plating)

the reason behind it? Actually in ancient times people did not understand the cause for the lightning. But now, we understand that lighting is caused by the accumulation of charges in the cloud. Let us learn about electric charges.

One day Murugan was getting ready to go to school. He combed his hair (before applying oil) with a plastic comb and placed it on the table. Suddenly he saw that a small piece of paper that was lying on the table was attracted towards the Comb. He wondered why the comb attracted the paper?. He repeated this and found that it happend again. He also noticed that comb did not attract the paper without combing the hair. Murugan was surprised and after going to school, he asked the science teacher about it. The teacher explained it with different activities.Let us do them and learn .

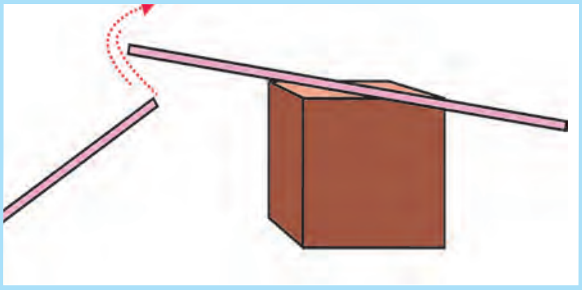
ACTIVITY 14. 4

Take a few bits of paper on a table. Bring an inflated balloon or comb near the paper bits. What happens?

Nothing happens. The bits are at rest. Rub the balloon or the comb with a piece of wool and bring it near the bits of paper. What do you find? The paper bits jump up and stick to the balloon.

ACTIVITY 14. 5

Take a plastic straw, rub it with a piece of wool and place it on a wooden block. Take another straw and rub it with a piece of wool and bring it near the first straw. What happens? The straws are repelling each other.



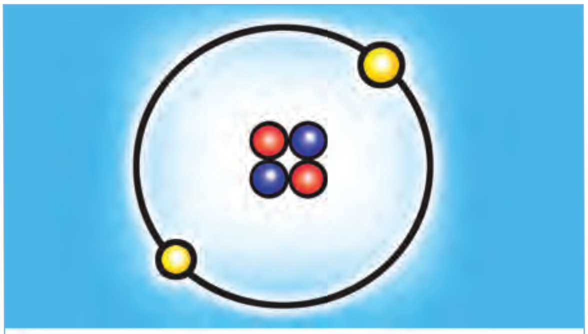
From the above activities we can easily find out that the balloon and the straw undergo some change when they are rubbed on a woollen material. They acquire a property known as an electric charge. This is because there is a transfer of charges between themselves due to friction. ie., in each case the object is charged by rubbing. These objects are called charged objects.

All these things happen because of Static electricity. Static electricity is the accumulation of electrical charges on the surface of a non conducting material. It is called "static" because there is no current flowing. What is a charge? To understand charge we have to look at things on an extremely small scale. Everything we see around us is made of atoms.

The atom is made of 3 types of particles. They are (i) electron (ii) proton and (iii) neutron. The electron is negatively charged, the proton is positively charged and the neutron has no charge, it is neutral.

Atoms usually have equal number of positive and negative charges(protons and electrons). Hence an atom is electrically neutral. This is why most objects around us are electrically neutral.

An atom is said to be electrically charged when the number of protons and the number of electrons is not equal. When the number of protons is higher than the number of electrons, the object is said to be positively charged. When the number of electrons is more than the number of protons, the object is said to be negatively charged. Hence charged objectes can have either positive charge or negative charge.



proton + electron – Neutron

We must notice that during the process of charging, only electrons are transferred from one object to another while protons and neutrons are tightly bound in the nucleus of an atom and do not come out of the atom.

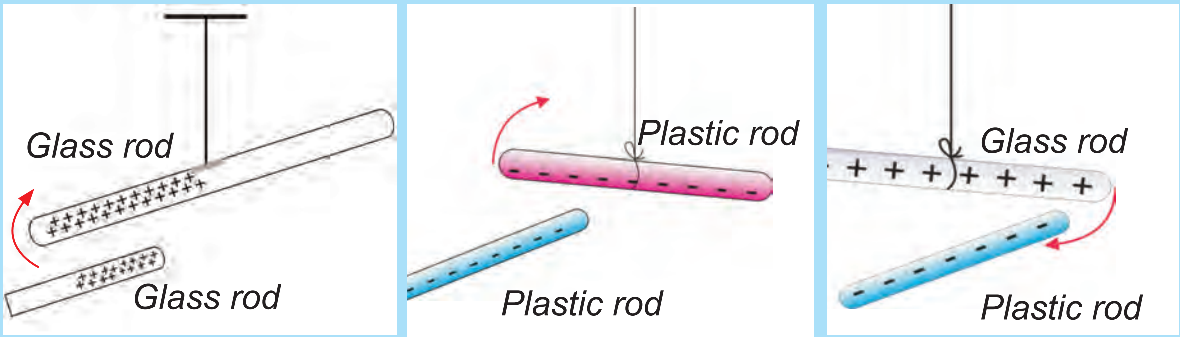
14.5.1. Types of charges

ACTIVITY 14. 6

Take a glass rod and rub it with a piece of dry silk. Suspend this glass rod from its middle with a silk thread. Bring it close to this another glass rod which is also rubbed with silk piece. What happens?

Now rub a plastic rod with a piece of wool, suspend the plastic rod from its middle with a silk thread. Bring it close to this another plastic rod that is also rubbed with wool. What happens?

We can observe in the above two cases that the suspended rods are repelled Now bring the rubbed plastic rod near the suspended glass rod and watch what happens? We can notice that the glass rod and the plastic rod get attracted towards each other.



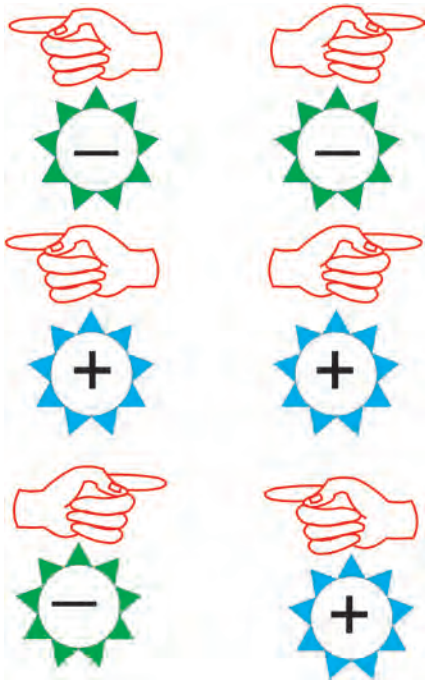
We have learnt that an object can be charged by rubbing. Do all bodies get same kind of charge? Let us answer this question by doing the above activity.

From those activities we can conclude that

1.There are two kinds of charges.

a). Positive charge - the charge is acquired by the glass rod when rubbed with silk

b). Negative charge – the chrage is acquired by the plastic rod when rubbed with wool



2. There is a force between two chrges

3. Like charges (positive and positive) or (negative and negative) repel each other

4. Unlike charges (positive and negative) attract each other.

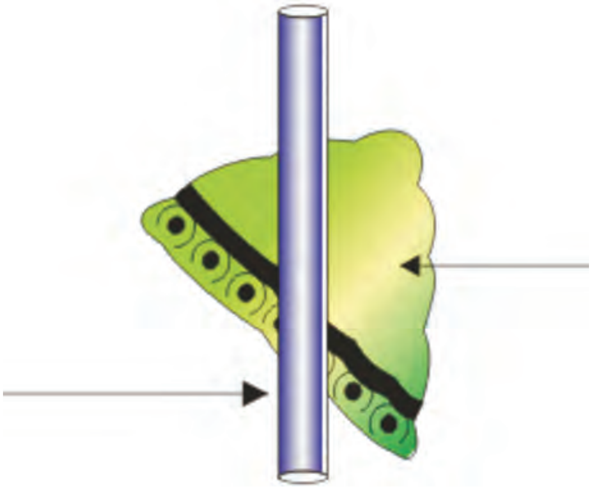
14.5.2. Transfer of Charges

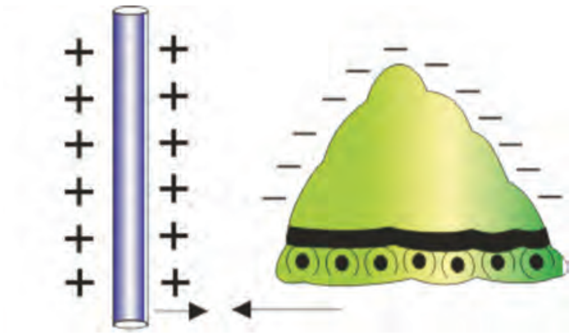
Let us study the methods by which an object can be charged.

Charging by Friction

We have seen in our earlier section that objects get charged when they are rubbed with suitable objects. How do they get charged?

When an object is rubbed with another object, the atoms in the objects get rubbed and a transfer of electrons take place between the atoms of the two objects. One object loses electrons while the other gains the electrons. Thus, the gain of electrons or loss of electrons makes both the objects charged.

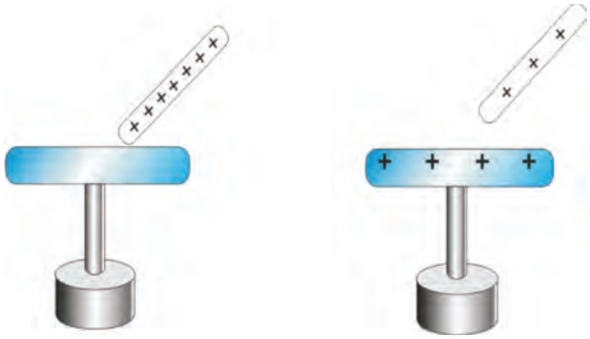




Charging by conduction

An object can also be charged by simply touching it by an electrically charged object. This process of charging is called as charging by conduction.

When a charged body is placed in contact with another body, charges get



transferred to the other body and both get charged.

Charging By Induction

A neutral object can be charged even without touching the neutral body with a charged body. This type of charging is called as charging by induction. This is done by bringing a charged body just close to the neutral body. When this is done, due to redistribution of charges inside the neutral body, the neutral body gets opposite charges on

the side near the charged body. Here no transfer of electrons takes place between the objects.

Electroscope

An electroscope is a device used to detect and measure electric charges. It works on the principle of transfer ofcharges by conduction or Induction.

Electroscope

MORE TO KNOW

When a charged body comes into contact with a body which is not charged, the electric charges jump from the charged body to the uncharged body till the charges on the two bodies are equal. This process is called as discharging.

An electroscope is made up of a metallic rod(usually brass) placed inside a glass jar. The upper end of the rod has a metallic knob and the lower end of the rod has two thin metallic leaves hanging parallel to each other. They are called leaves because they are very thin. The early electroscopes used gold leaves and so these were called gold leaf electrocopes.

When a charged object touches the knob of the electroscope, the charge is transferred to the knob because of conduction. This charge is then transferred to the gold leaves through the metal rod.

The leaves, now repel each other (because they have similar charges) and separate out. By observing this we can check if a body carries charge.

MORE TO KNOW

Connecting a charged object to the earth with the help of conducting wires or physical contact is called as Earthing. The earth is considered to be huge reservior of electrons. Depending upon the charge on the object, the earth provides or accepts electrons from a charged object conneted to it.

Many electrically operated devices in our homes(eg. washing machines, refrigirator wet grinders etc.,) have earth connection. This is done so to save human handling them safely and to save the appliances also.

PHYSICS

We can also find the nature of the charge by changing the gold leaf electroscope by induction.

14.5.3. Story Of Lightning And Thunder

Lightning is an awe-inspiring display of electricity in nature. You might have seen lightning during thunderstorms. lightning occurs because of a massive electric charge flowing from cloud to cloud, from one part of the cloud to another or from the cloud to the ground.

Thunder clouds (rain clouds) carry electric charges and these charges separate out within the cloud. The lower portion of a cloud generally carries negative charges and the upper portion carries positive charges.

These charges inside the clouds build up but they cannot flow from one cloud to another or to the ground because the air between them acts as an insulator. But when huge amount of charges build up, the insulating property of the air suddenly breaks down. As a result, an electric discharge takes place between two oppositely charged clouds or between a charged cloud and the surface of the earth. This causes the flash of lightning that we see in the sky.

The enormous amount of heat produced during lightning causes the air to expand and vibrate suddenly,which is the cause of thunder.

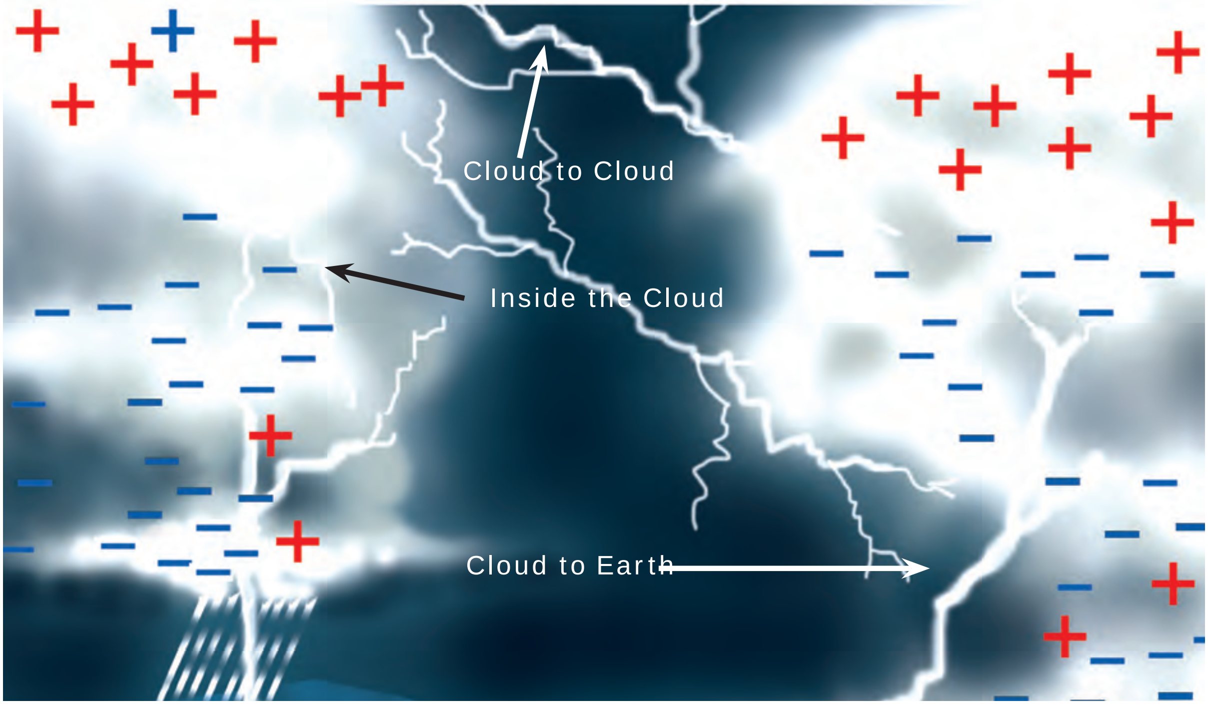
14.5.4. Lightining-Safety

Lightning is a high energy electric discharge. It strikes the earth with a lot of energy and heat. It could be very dangerous. Therefore we must know how to protect ourselves during thunderstorms. Some safety measures that could be taken are

1. Do not shelter under a tree during thunderstorms. If the tree gets struck by the lightning, it could catch fire and cause great harm to you.
2. We can shelter inside our homes, cars or buses.
3. Do not run across a large open fields or high grounds.

Safe position during lightning

4. If we can't find a safe place, squat down in a low-lying place.

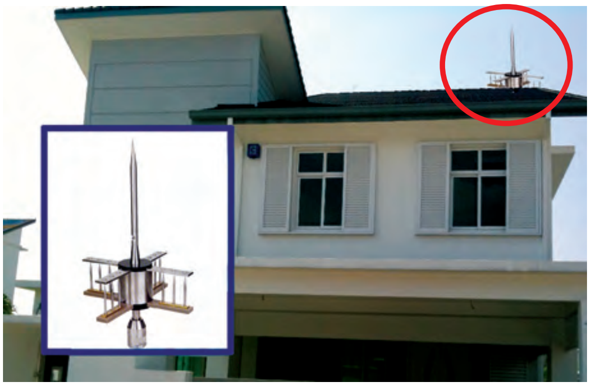


"Benjamine Franklin carried out the famous Kite experiment' to show that lightning was an electrical phenomenon. He flew a kite in the sky on a stormy day and tied the other end of the Kite string made up of metal to a metal key. Lightning struck and got transferred to the metal key.Frankline was fortunate enough to have been saved from a massive electric shock."

PHYSICS

Lightning Arrester

In order to protect tall buildings from lightning, Lightning arresters are used. It was invented by Benjamin Franklin. It is a metal rod with pointed edges. It is fixed at the top of the buildings to be protected. This rod is connected to the ground with the help of a conducting cable. The lower end of the cable is connected to a copper plate buried deep into the earth. Lighting strikes the rod and the electric charges are carried harmlessly to ground through the cable.



14.6. HEAT

Ram, who lives in Ooty invited Murugan, who lives at Chennai to spend a few days during summer. When Murugan went to Ooty they conversed about the weather. Now read the conversation between the two.

Murugan : Ram! It is too hot in Chennai and the temperature is about 40°C.

Ram: Even in Ooty we feel that it is hot and the temperature is about 27°C.

Murugan: Oh! that's not too hot Ram

Ram: Of course. It is. Normally we experience an average of 17°C throughout the year. So, considering that 27°C is hot for us.

Murugan : But for people living in Chennai 27°C is a normal temperature and I enjoy the climate here. Thank you for inviting me to spend my holidays with you in Ooty.

From the above conversation you can realise that what appears to be hot for Ram does not seem so hot for Murugan. Similar is the case with cold. What appears cold to one person may not seem so cold to the other. Thus, we can say that the terms hot and cold are relative. We can usually get a rough idea of how hot or cold an object is by touching it. Our own estimate of measuring is not accurate. Scientist have defined the quantity temperature which gives the measure of the degree hot or coldness of a body.

Heat is defined as a form of energy which flows from a body with a higher temperature to a body with a lower temperature. Temperature is measured by using thermometers.

14.6.1. Effects of heat:

The sun is a major source of heat. Without the heat from the sun it would be difficult for any form of life to survive on this earth. We see many effects of heat in our daily life: Wet clothes drying in the sun, burning candle or oil lamp, ice melting in a glass of water and food cooked.

Let us study each of these effects

(i) Rise of temperature

The temperature of the body rises when it is heated. On the other hand the temperature falls when heat is taken away from the body. Hence heating changes the temperature of a substance. Different substances require different amount of heat for the same rise in temperature. Example oil gets heated up faster than water.

(ii) Change of state

When we heat a solid it begins to melt at a certain temperature, known as melting point and becomes liquid. Similarly when a liquid is heated it begins to boil at a particular temperature called its boiling point and become gas. Hence change of state occurs when substances are heated.

(iii) Change in physical properties

Heat changes the physical propeties of a substance. e.g, Zinc, which is brittle and hard at room temperature becomes soft and flexible at high temperature. Iron on being heated becomes soft and can be easily changed into any shape. The electrical resistance of a conductor increases on heating. A magnet loses its magnetism on being heated.

(iv) Chemical change

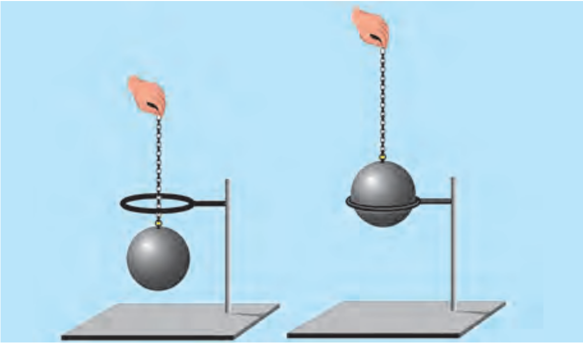
Heat accelerates chemical action. Calcium carbonate decomposes on heating.

(v) Expansion

Substances expand on heating and contract on cooling.

Expansion of solids

You can demonstrate this by a simple activity known as ball and ring experiment. Take a metal ring and a ball. The diameter of the ball should



be in such a way that it can just pass through the ring at room temperature. If the ball is heated in a flame and then placed on the ring, it does not pass through it.

This shows that it has expanded. It will be seen that the ball passes through the ring after it cools.

From the above activity we can infer that solids expand on heating. When temperature of a substance is increased, its molecules or atoms, on an average move faster and further apart. The result is an expansion of the substance. This is called 'Thermal Expansion'.

Except a few substances, all solids, liquids and gasses expand. But expansion takes place in all three states of substance. For the same amount of heat given, solids expand the least while gases expand the most.

Thermal expansion finds variety of applications in our daily life.

1. When railway lines are laid some space is left between the two rails (made of iron) to allow for expansion during summer.

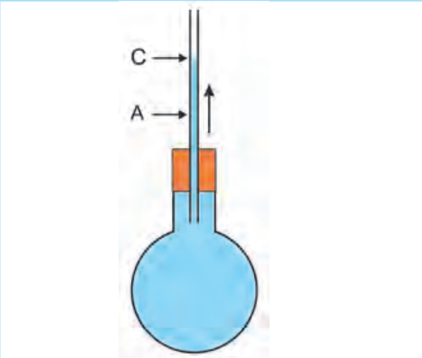
If this is not done the rails would expand and bend there by causing derailment of trains.

2. The telephone wires between two poles sag in summer and become tight in winter. The wires are laid in such a way that they are allowed to expand or contract.

3. A glass stopper sticking in the neck of the bottle may be made loose by slightly warming the neck of the bottle. The neck expands but not the stopper. Similar is the case with the pen.

4. A thick glass tumbler usually cracks if very hot or cold liquid is poured in it. Since glass is a bad conductor of heat, the inner surface of the glass expands more than the outer surface, when a hot or cold liquid is put in to it. Due to this unequal expansion, the glass cracks.

ACTIVITY 14. 7



Take a glass flask fitted with a one- holed stopper. Insert a thin glass tube and mark the water level in it as A. Now, heat it for a few minutes. There will be a steady rise in the water level. Note the water level and mark it as C. This shows that liquids expand on heating.

Expansion in liquids

Like solids, liquids also expand appreciably when they are heated. A liquid has a definite volume but it has no definite shape. Therefore, only volume expansion is considered. The expansion of liquids is greater than that of solids.

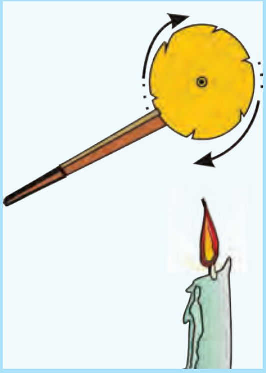
Expansion in gases

When the temperature of a gas increases on heating, its volume increases and it expands. Do you know that tyres filled tightly with air, burst in hot summers? Why? It is because the air inside it expands due to heat.

Let us explain this with an activity

A balloon fixed to the neck of a

ACTIVITY 14. 8



Take a thin metal foil and fix it at the tip of a needle so that it can rotate. Place a burning candle below this set up. Now we can see that the metal foil will rotate.The air above the candle gets heated and the warm air moves up and it rotates the foil.

bottle blows up if the bottle is placed in a bowl of hot water. If it is removed, the balloon keeps contracting. This is mainly due to expansion of air inside due to heating.

14.7.TRANSFER OF HEAT

We have learnt that heat always flows from a higher temperature to a lower temperature. There are three different ways in which heat is transferred from one body to the other.

They are (i) Conduction (ii) convection and (iii) radiation.

Conduction of heat

Heat flows from one object the other when they are in contact with each other. For example a metal spoon left in hot water takes heat from the water and becomes hot. If you touch the metal spoon now, you will feel the heat. This method of transfer of heat from a body at a higher temperature to a body at a lower temperature when they are in direct contact is called thermal conduction.

Convection

When fluids (liquid and gas) are heated the molecules closer to the source of heat get heated first and expand, thereby the density of the liquid decreases. The lighter molecules rise up and cooler and heavier molecules come down. This is called convection.

ACTIVITY 14. 9

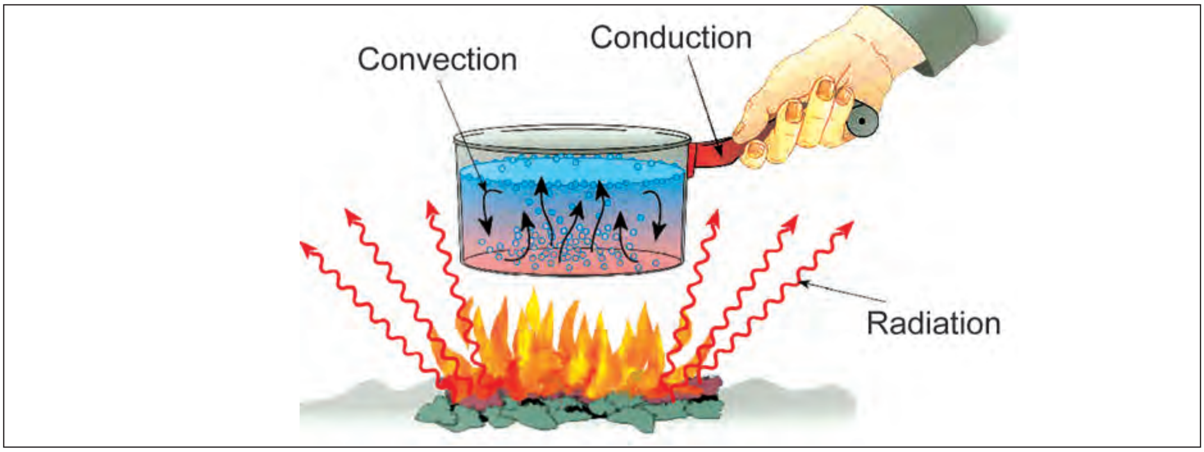
Take a beaker of cold water and put some Potassium Permanganate- crystals in it. Slowly heat the water. You can see the colour rising through the water. It is due to convection

Thus convection is the transfer of heat due to the actual movement of particles.

Radiation

The sun is far away from earth and most of the space between the sun and the earth is empty. But still the warmth of the sun reaches the earth. The heat of the sun cannot reach us by conduction or convection as there are practically no molecules between the sun and earth to carry the heat through.

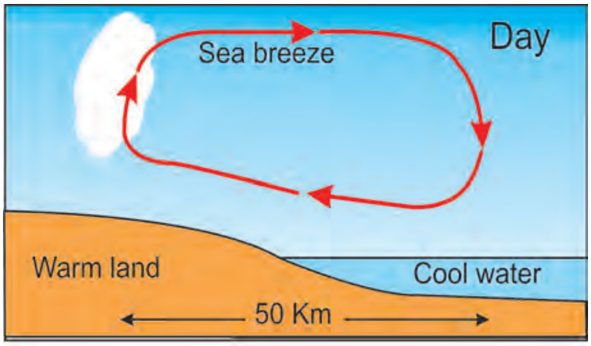
The process by which heat is transferred without the help of any material or medium is called **radiation**

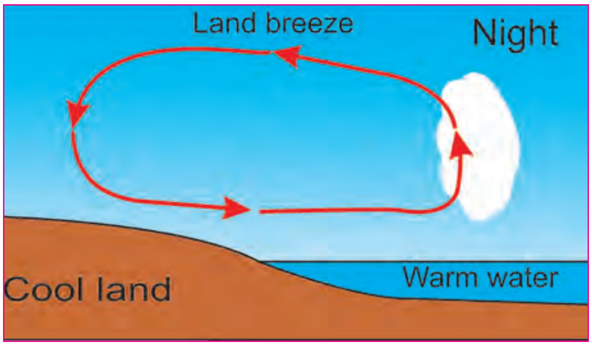


MORE TO KNOW

Winds are caused by convection currents. During the day, the land warms up more than the sea. The warm air over the land rises and cold air from the sea moves in to replace it. So during the day, breeze blows from the sea to the land. This is sea breeze.

At night, the land cools down faster than the sea. The warmer air over the sea rises. Cold air over the land moves in to replace it . So during night breeze blows from the land on to the sea. This is land breeze.





EVALUATION

1. Fill in the blanks.

i. The current produces ______ change, when it is passed through solutions (physical / chemical).

ii. The device used to detect and measure electric charges is ________. (electroscope/spectroscpoe)

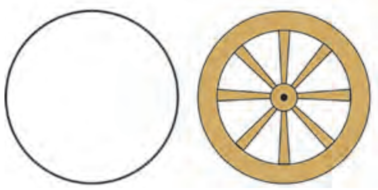
2. Match the following:

i) Lightning	__	transfer of heat
ii) weak electric current	__	attract each other
iii) conduction	__	lightning arrestor
iv) opposite chargers	__	LEDs can be used

3. Standing on a steel chair, Prem tried to change the fused bulb in his house. His father advised him to stand on a wooden chair. why ?

4. Based on the property of conduction of current, find the odd one out
   1. Silver,Platinum,Sodium,wood
   2. Plastic, Match stick, Paper, SafetyPin
   3. Salt solution,Purewater,Lemonjuice,Hydrochloric acid

5. Swetha rubbed a Plastic ruler on her hair,then took the ruler close to bits of paper. The bits of paper got attached towards the ruler. But when Geetha tried the same with a metal ruler, the bits of paper did not stick to the ruler. Could you expalin why ?



6. It was a cold winter moring Geetha went for a walk. She saw some people sitting around a fire built of the waste materials around them why were they sitting ? Explain the process of heat transfer occuring here?

7. It was a heavy rain with thundertstorms Vijay was sitting with his brother in the house vijay said to his brother that the thunder is caused because of big collision between two clouds Do you think Vijay is right? why?

8. Jaya wants to fix an iron ring on a wooden wheel but the wooden wheel is the same size as the iron ring. Could you help Jaya to fix the ring ?

9. Children are playing in the play ground. Suddenly clouds gathered over the sky and there is a big thunder and lighting .What should they do now? Select the correct one . The children should

   a. Run to their houses   b.Stand under a tree
   c. Just stand at their places   d.Squat down

10. Petrol tankers plying on highways often have metal chains attached that drag along the road.could you say why?

Project work

Make your own electroscope

Take a glass bottle,a piece of stiff card,a thin alumuinium foil of 4cm x 1/2 cm,cellotape,10cm long thick insulated copper wire, a comb, a piece of silk or cotton cloth. Cut out a circular piece of stiff paper to fit the mouth of the bottle.

Remove about one inch of insulation from both ends of the wire.Bend one end of the wire by 90°. Fold the aluminium foil and hang it inside the bottle as shown.

push the wire through the centre of the stiff card such that it fits tightly. Now tape the card into position over the bottle as shown.

Rub the comb vigorously on your hair. It becomes charged now. Gently touch the top of the wire with the comb and then move it away.we can see the thin leaves of the foil diverge.

This is because the charges from the comb are carried by the wire to the foil. since both the leaves of the foil get same kind of charge, they repel.

Remember all the experiments with electroscopes work well on a cold, dry day.

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PHYSICS

CHAPTER 15

LIGHT AND SOUND

15. LIGHT AND SOUND

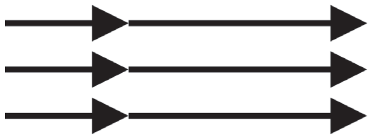
INTRODUCTION

Meera and her friends were enjoying themselves on a picnic. They had a wonderful time visiting new places. Suddenly Meera felt a flash of light falling on her face. She looked around and saw her friend holding a mirror in her hand. From where did that light come from? How?

We are familiar that the light can be made to fall on the face of a person or any object using a plane mirror. The sunlight falling on the mirror is sent back and it fell on Meera's face.

The bouncing of light from a surface of a body is known as **reflection** Everything that is around us is seen by our eyes because of the phenomenon of reflection of light.

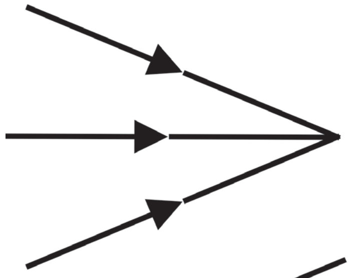
A Ray



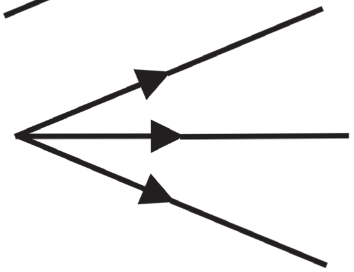
Parallel Rays (Beam)

Light travels along a straight line.

The path taken by the light is known as ray and is represented by a straight line with an arrow mark. The arrow mark denotes the direction of light.



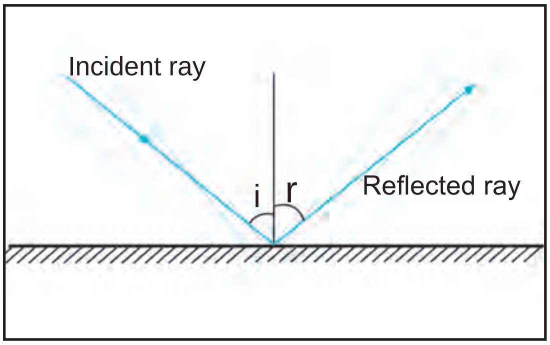
Convergent Beam



Divergent Beam

Two or more rays form a beam. When the rays are parallel. This is known as Parallel beam.

If the rays meet at a point (converging), they form a convergent beam. If the rays move away from a point it is called as divergent beam.



A light ray which strikes the surface is called as an **incident ray.**

The light ray that comes out from the reflecting surface after reflection is called **reflected ray.**

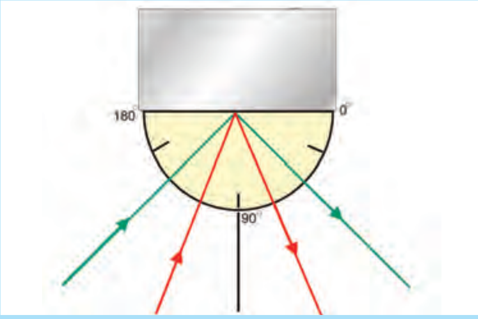
The perpendicular line drawn to the surface at the point of incidence is called a **normal.**

The angle in which the incident ray makes with the normal at the point of incidence called as the angle of **incidence.**

The angle which the reflected ray makes with the normal drawn point of incidence is called **angle of reflection.**

ACTIVITY 15.1

Arrange the drawing sheet, protractor and a plane mirror as shown in the diagram. Using a protractor, draw the normal,incident rays at different angles. Make a ray of light fall on the mirror along the surface of the sheet at different angles. Everytime draw the path of the reflected ray. Measure the angle of incidence and the angle of reflection and tabulate it.



Is there any relation between the two paths of light?

Is there any relation between the angles made by the incident ray and the reflected ray with the normal ?.

When light falls on the mirror as shown in the diagram, what happens?

The angle of incidence i = __________

The angle of reflection r = __________

The light ray will be sent back along the same path or the light ray will retrace the path.

Inference

1. The incident ray, the normal at the point of incidence and the reflected ray lie on the same plane.

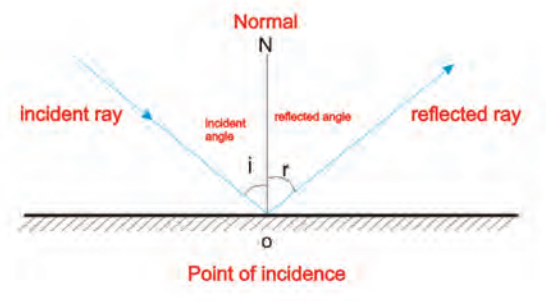
2. The angle of incidence = angle of reflection. These are known as the Laws of reflection. These laws are true for all reflecting surface.

15.1. LAWS OF REFLECTION

1. The angle of incidence is equal to the angle of reflection.

$$\angle i = \angle r$$

2. The incident ray, the reflected ray and the normal to the surface at the point of incidence lie in the same plane.



If you stand before a wall, can you see your face? No.

On the other hand, if you stand before a mirror, you can see your face. Why?

Though light is reflected from the entire surface, we can see image of the object only from highly polished surfaces.

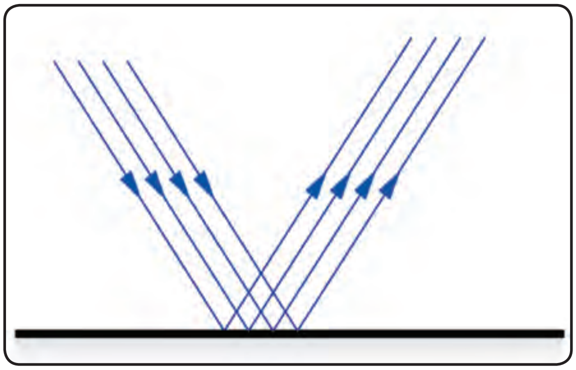
The mirror is a highly polished surface and hence we can see our face. But the wall is not a polished surface. So we cannot see face.

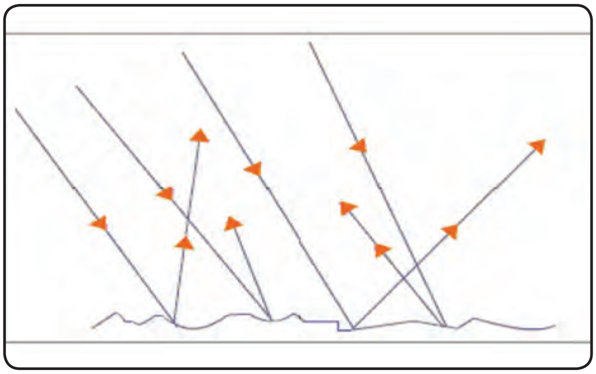
15.1.1. Regular and Irregular Reflections

Reflection from a polished surface is called **Regular reflection**.

Reflection from a rough (unpolished) surface is called irregular or diffused reflection

In the case of a rough surface, light is not reflected in one direction, it is scattered in all directions. This is called a diffused or **irregular reflection.**



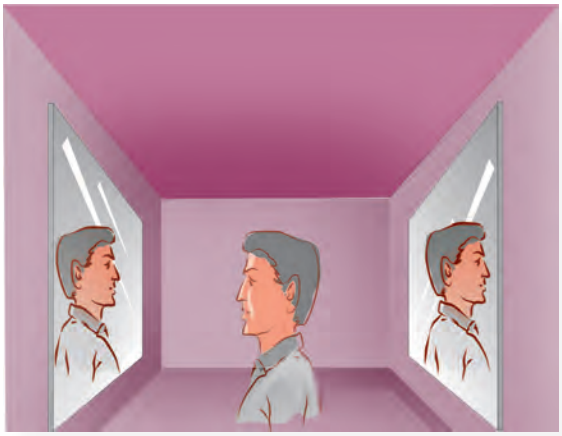


15.1.2. Multiple reflection

What do we see when we enter into a jewellery shop, a barber shop, hotel, bakery?

We can see number of images. How does this happen? It is just a trick using mirror.

How are the mirrors to be arranged so as to get maximum number of images Have you ever tried to look at the back of your head in a mirror?



If you have, you may know that you need two mirrors to see the back of your own head. This is because of multiple reflections.

15.1.3. Multiple Images

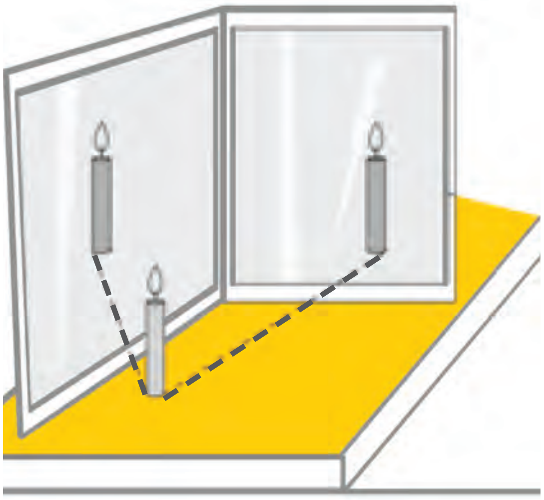
You are aware that a plane mirror forms only a single image of an object.

ACTIVITY 15.2

Make a list of various objects around you like walls, window pans, table tops, polished granite surface, trees, car etc.,

Look at yourself through the surface of all these objects. If you see your image, then it is due to regular reflection.

If you cannot see your image, then it is diffused reflection.



Multiple reflections
and
Multiple Images

ACTIVITY 15.3

Keep a burning candle before a plane mirror and hold another plane mirror at an angle to the first mirror. Do the same for various angles between the mirrors?

Count the number of images formed each time?

DO IT YOURSELF

A garden in a chalk box.

Place the mirrors on opposite sides of a chalk box so that the reflecting surfaces face each other.Keep two or three flowers of different colours in the chalk box. Make a hole on any one of the sides with the mirror and remove the coating on the mirror in front of the hole. Now look into the box through the hole.

Place mirrors on all sides of the chalk box and repeat the experiment. What do you see?

ACTIVITY 15.4

The students are divided into groups. Each group is provided with two mirrors. The two mirrors are fixed using cellophane tape so that thay can be arranged in different angles.

The mirrors are fixed at a particular angle and an object is placed between them. Now note the number of images formed. Complete the table by observing the number of images formed.

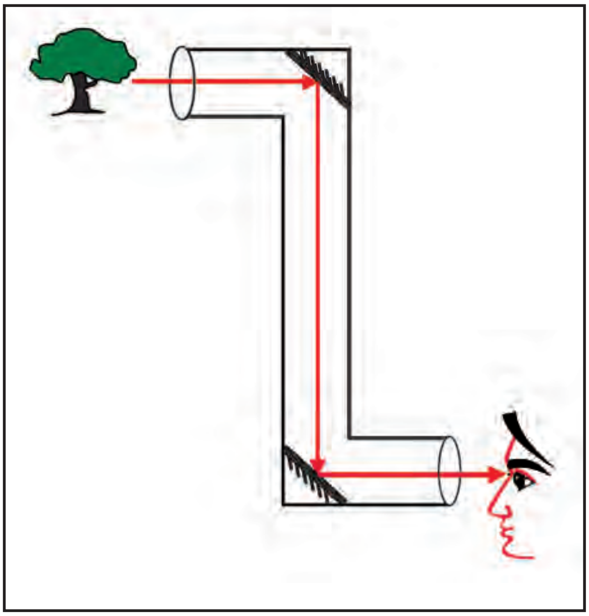
Angle	Number of images
30^0	
45^0	
60^0	
90^0	
120^0	

Is there any relation between the number of images and the angle between the mirrors ?.

$$\text{Number of images} = \frac{360}{\text{angle}} - 1$$

When the mirrors are placed parallel to each other,maximum number of images will be formed.

Based on the principle of multiple reflections we can make the Kaleidoscope and Periscope.

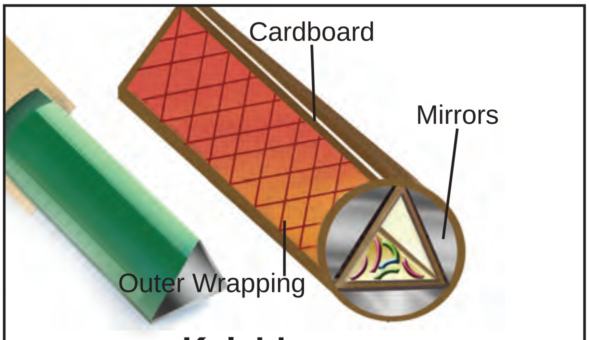


Mirror Periscope

The working of a periscope is based on the principle of successive reflections from two plane mirrors.It consists of two plane mirrors facing each fixed at 45^0 to the frame work of a tube. Fix the two mirrors at an angle of 45^0 as shown in the figure. Observe through one end.

ACTIVITY 15.5

Take three equal mirror strips and join them as shown in the figure. Now place few pieces of broken bangles between the mirrors. Fix them in a circular cardboard tube. Close one end of the tube having a hole in the centre through which we can see. Close the other end completely. See through hole. What do you observe?



Kaleidoscope

15.2. REFRACTION

When light rays pass from one medium to another medium the path of the ray will be changed This is **refraction**.

ACTIVITY 15.6

- Can you bend a pencil without breaking it?
- You can make a pencil look as if it has been bent. How?

Take a glass beaker. Fill half of the beaker with water. Place a pencil inside

it. Look at the water from the side, the pencil will look bent. Now take the pencil out of the water. We will not see the bent. Why did the pencil look bent when it was in the water?

Light rays change the direction before reaching our eyes. This makes the pencil look bent. How is light deviated?

The direction of deviation depends on the densities of the two media. The medium of greater density is known as denser medium and the medium of lower density is known as rarer medium.

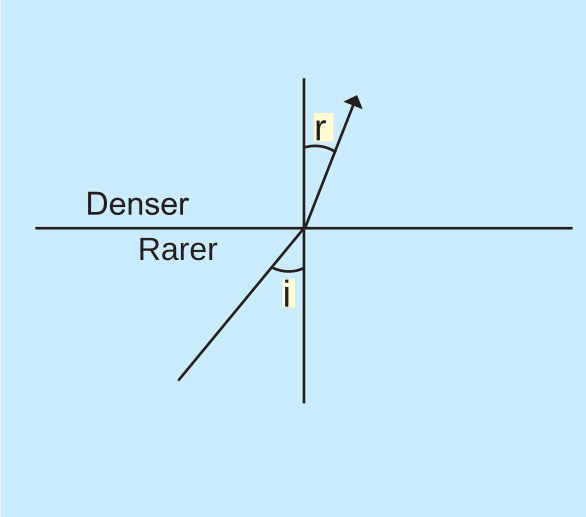
Classify the pairs of media as denser and rarer.

a. Air, water

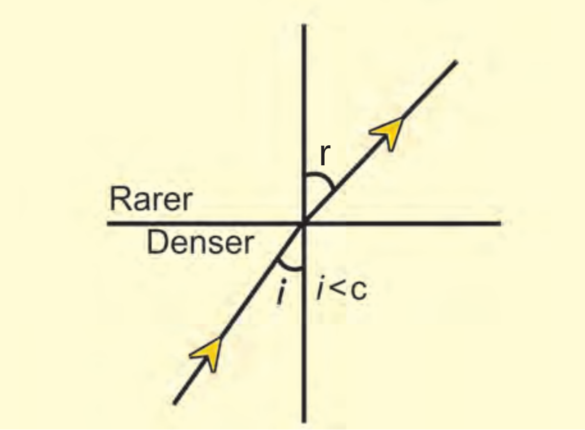
b. Air, glass

c. water, glass

1. When light travels from a rarer medium and enters into a denser medium, it will be deviated towards the normal.



2. The light will be deviated away from the normal when it passes from a denser into a rarer medium.



Every day Effects of Refraction

1. Fruit appears to be bigger in a glass of water due to refraction.
2. Printed letters appear to be raised when a glass block is placed over it.
3. A swimming pool appears shallower than its actual depth.

15.3. DISPERSION

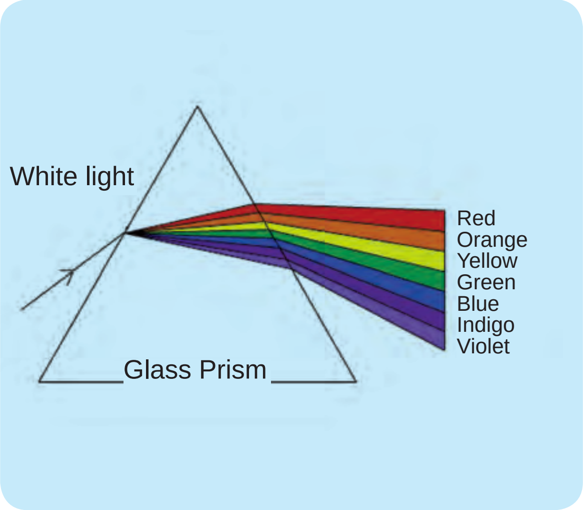
The rainbow is one of the most beautiful sights in nature. Rainbows are seen not only across the sky but also in sprays of water near the water falls. Sometimes the rainbow colours are also seen on soap bubbles and oil films on puddles of water. Where do these colours come from?

Newton passed a narrow beam of sunlight through a prism and obtained a band of seven colours-violet, indigo, blue, green, yellow, orange and red(VIBGYOR) on a white screen

placed on the other side of the prism. Each colour merged into to the next. He called this band of colours as the spectrum.Thus Newton established that white light consists of seven colours.

Do you know why white light splits into seven colours when passed through a prism?

The splitting of white light into its constituent colours (seven colours) is called **dispersion**



When white light is incident on the prism, the different colours of light get refracted or deviated through different angles.

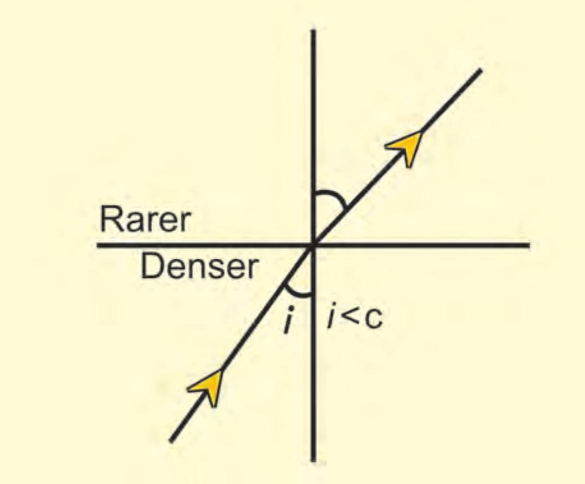
15.4. TOTAL INTERNAL REFLECTION

Consider a ray of light passing from a denser medium to a rarer medium.

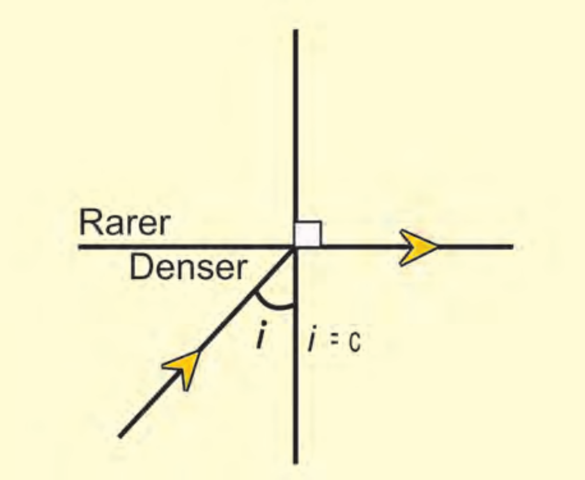
When a ray of light passes from a denser medium to a rarer medium, the refracted ray is bent away from the normal.

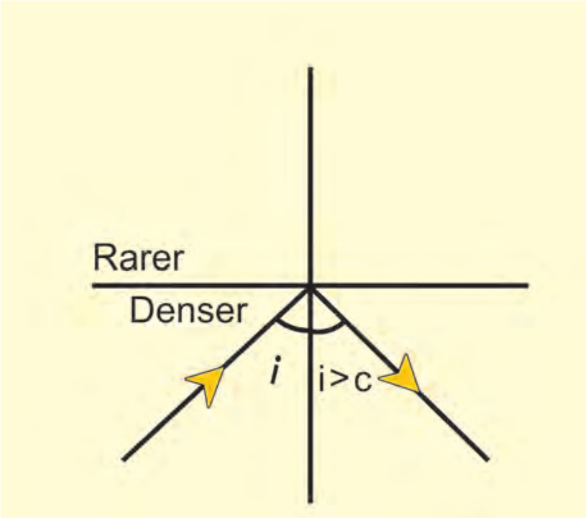
As the angle of incidence increases, the angle of refraction also increases.

At a certain angle of incidence, the angle of refraction becomes 90°. The angle of incidence for which the angle of refraction becomes 90° is called as the critical angle C.



If you further increase the angle of incidence, at one point the ray will be completely reflected back in to the same medium. This is known as total internal reflection.





If the angle of incidence is more than the critical angle, the ray bends inside the denser medium itself. This is total internal reflection.

MORE TO KNOW

Total internal reflection is the main cause of the brilliance of dimonds.

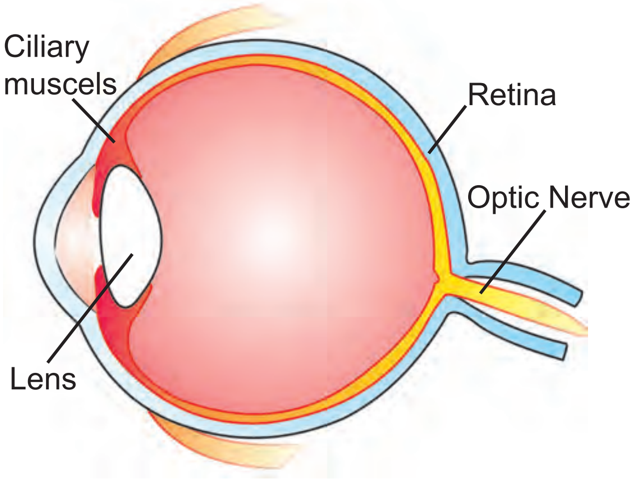
Necessary conditions for total internal reflection

1. The light must proceed from a denser medium to a rarer medium.
2. The angle of incidence in the denser medium must be greater than the critical angle.

15.5. THE HUMAN EYE – IMAGE FORMATION

The human eye has a convex lens. The convex lens of an eye forms an image of the object on the screen called the retina.The retina is covered by large number of nerve fibers sensitive to light. They carry the image by means of optic nerves to the brain.

The human eye focuses the image for different object at different distance by changing its focal length of the lens. This is done by the ciliary muscles, which stretches and relaxes to change the focal length of the lens. This action of the eye is called as power of accommodation of an eye. The most comfortable distance at which one can read with a normal eye is about 25cm. This distance is called least distance of an eye.The minimum distance at which the eye can see objects distinctly varies with age.



PHYSICS

15.6. SOUND

We hear many types of sounds around us everyday. Each type of sound is the characteristic of the object producing it.

Sound around us - Different sounds

ACTIVITY 15.7

By observing the picture, list the various sounds produced.

1. ------------------------------- 4.-------------------------------------
2. -------------------------------- 5.-------------------------------------
3. -------------------------------- 6.-------------------------------------

ACTIVITY 15.8

Sound is produced due to vibrations in a stretched rubber band.

Take a rubber band. Put it around a pencil box. Now pluck the rubber band in the middle. Do you hear any sound? Does the rubber band vibrate? So, when it is vibrating, it produces sound.

15.6.1.SOUND NEEDS A MEDIUM FOR PROPAGATION

When you call up your friend Gopal who is standing far away,he is able to hear your voice. How does the sound travel to Gopal?

Sound can travel through solids

ACTIVITY 15.9

Collect a metal plate, a glass tumbler, a plastic mug, a sheet of paper, a wooden block, a cloth. Now tap them all one by one with a small stick. Do they all make same type of sound?

How is the sound produced? Vibration of bodies produce sound.

ACTIVITY 15.10

Take a scale and hold its one end firmly on the table with one hand as in the fig. Pluck the free end of the scale with your other hand. The scale begins to vibrate. Touch the scale with your finger. It stops vibrating. Does it produce any sound now?

ACTIVITY 15.11

Touch a bell when it is not in use. What do you feel? Now beat the bell with an iron rod. Again touch it when it is producing sound. Can you feel the vibration in your hand? This activity proves that sound can travel through solid.

ACTIVITY 15.12

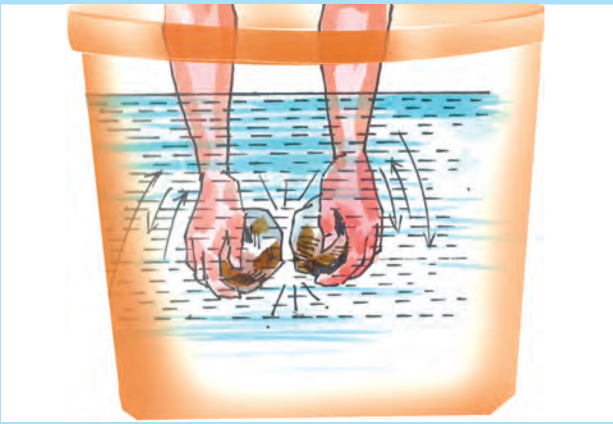
Take a wodden stick and press your ear at one end of it. Ask your friend Mani to gently tap at the other end.

You will be able to hear the sound very clearly.

ACTIVITY 15.13

Make a toy telephone by using two empty ice cream cups. Make a small hole at the bottom of each cup. Pass the ends of a string through the holes. Tie the ends to match sticks to hold them in place. Stand away, ask your friend Gopal to speak into one of the cups. Can you hear your friend's voice?.

ACTIVITY 15.14



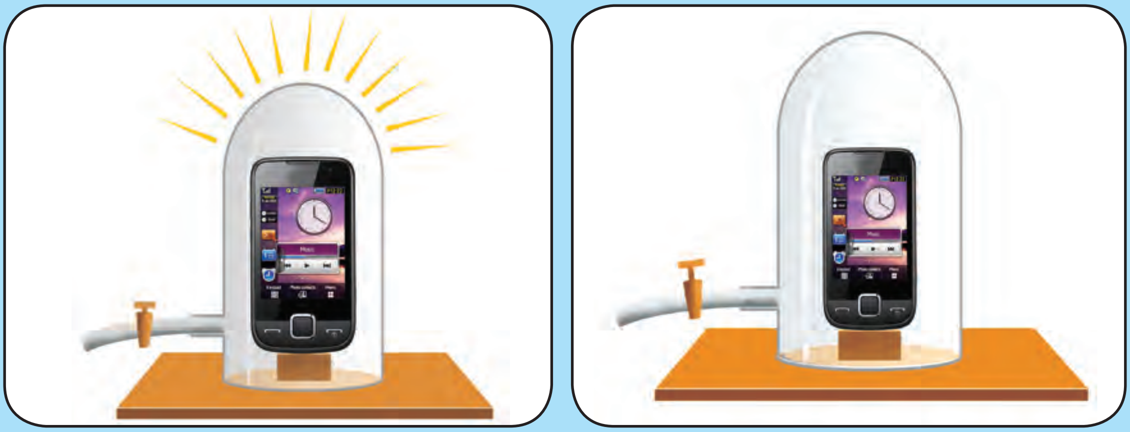
Take two stones or marbles and beat them together. Listen the sound. Then submerge them in a bucket of water. Beat the stones or marbles under water. Listen to the sound now. Keep your ear near the bucket. The sound heard is clearer and louder when the stones are submerged in water.

- Sound travels very much faster in solids than liquid and air.

- Sound needs a medium for propagation. It cannot travel through vacuum.

ACTIVITY 15.15

Keep a cellphone in a bell jar and set it ringing. Pump out the air from the bell jar by using a vacuum pump. As more and more air removed from the bell jar, the sound gets feebler and finally it is heard faintly, although the working of the cellphone can be seen. This shows that sound cannot travel through vacuum.

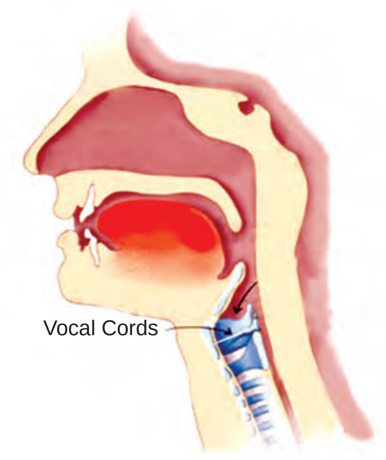


Sound plays an important role in our lives. It helps us to communicate with one another. It is difficult to communicate without talking. Every one and everything around you is making a sound.

15.6.2. Sound produced by humans

Speak loudly or sing a song or buzz like a bee.

In human beings, the sound is produced by the "Voice box" or the



PHYSICS

MORE TO KNOW

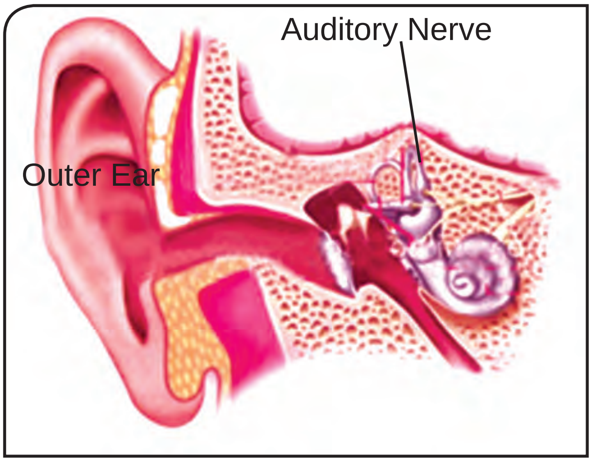
The vocal cords in men are about 20 mm long. In women, these are about 15 mm Children have very short vocal cords.

Larynx. The voice box has two “vocal cords”. They are stretched across the voice box in such a way that it leaves a narrow slit between them for the passage of air. When we speak, the lungs force air through the slit and the vocal cards vibrate , producing sound.

15.6.3. Human ear and Hearing

How do we hear sound?

We know that vibrating objects produce sound which is carried in all directions through a medium. Our ears help us to hear sound. Human ear has three important parts. Only one of its parts can be seen and felt by you, which is the outer ear.



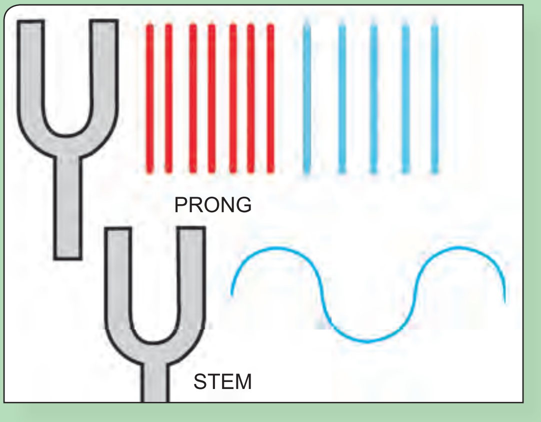
The outer ear consists of the Pinna and the ear tube. The shape of the outer part of the ear is like a funnel. When sound enters the ear, it travels down a canal at the end of which a thin membrane is stretched tightly called **“ear drum”** which performs a very important function.

The middle ear has three tiny interlocked bones. The inner ear has a coiled organ of hearing semi circular canals and the auditory nerve.

A vibrating body causes air molecules to vibrate. These vibrations reach our ear and are collected by the pinna and then funneled into the ear tube. These vibrations strike the eardrum and start vibrating. The ear drum sends vibrations to the inner ear. From there the signal goes to the brain. That is how we hear.

We must never put a sharp or hard object into our ear. It can damage the eardrum. The damaged ear-drum can impair hearing.

15.6.4. Amplitude, Time period and Frequency of a vibration



ACTIVITY 15.16

To demonstrate how vocal cords produce sound:

Take two rubber strips of the same length and width. Put them one above the other. Hold them at both ends and stretch them tight. Blow air through the slit between them. Is sound produced? The structure of vocal cords is similar.

You have learnt that to and fro motion of an object is called vibration. A tuning fork is made of steel. The two upper ends of the tuning fork are called the 'prongs', while the lower end is called the 'stem'.

Strike the prongs against a hard rubber pad and observe the vibrations. Hence, a vibrating tuning fork produces sound.

Frequency (n): The number of oscillations per second is called the frequency. Frequency is expressed by hertz – Hz

Time period (T): The time taken by the vibrating body to complete one vibration or oscillation is called the time period. The unit of period is second(s).

Amplitude (a): The maximum displacement of a vibrating body from its mean position is called amplitude. The unit of amplitude is metre (m)

The relation between frequency (n) and time period (T)

The period of oscillation is the reciprocal of the frequency.

$$T = 1/n$$

We can recognize many familiar sounds without seeing the object producing this sounds. How is it possible? These sounds must be different to enable you to recognize them.

- Amplitude and Frequency are two important properties of sound.
- The loudness of the sound depends on its amplitude.

15.6.5. Audible and Inaudible Sounds

The sounds of frequencies less than 20 vibrations per second (20 Hz) can not be heard by human

ear. They are called inaudible sounds. On the higher side 20000 Hz are also not audible to human ear.

Thus the human ear can hear the range of audible frequencies between from 20 to 20000Hz.

MORE TO KNOW

Sound waves of frequencies above 20,000 Hz are called ultrasonic waves. Bats use ultrasonics waves for their flight.

Some animals can hear the sound of frequencies higher than 20000 Hz. Dogs have this ability.

15.6.6. Noise

The unpleasant sound is called as noise. In the class room, if all the students speak together, what would the sound produced be called? It is noise.

On the other hand, you enjoy sound from musical instruments. Musical sound is one which is pleasing to the ear.

15.6.7. Noise pollution

The unwanted sound from any source that causes discomfort of any kind is called noise pollution.

Harmful effects of noise pollution

- Exposure to sudden high noise level can damage to the eardrum.
- High noise level can also lead to nervous tension and increase of blood pressure.
- It also disturbs sleep, increases stress and causes headache.

To control noise pollution

1. The use of loud speaker at functions should be stopped.
2. Cars and other vehicles should not produce loud sound.
3. T.V and Musical system should be played at low volumes.

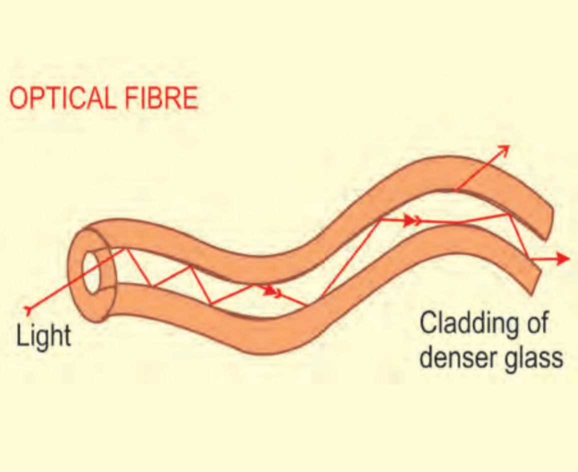
15.7. SCIENCE TODAY

An optical fiber is a device based on the principle of total internal reflection.

Optical fibers are thin, flexible and transparent strands of glass which can carry light along them very easily. A bundle of such thin fibers forms a light pipe.

When light is incident at one end of the fiber at a small angle the light that passes inside undergoes repeated total internal reflections along the fiber. The light finally comes out .

Even if the fiber is bent or twisted, the light can easily travel through the fiber. The method of using optical fibers to carry images and messages is called fiber optics



Uses of optical fibers

1. Optical fibers are used to transmit communication signals.
2. In medicine, optical fibers are used in endoscope and laporoscopes.

ACTIVITY 15.17

Observe the given picture and choose one word for each from the following words. Soft, Loud, Pleasant, Unpleasant

....

....

PHYSICS

EVALUATION

LIGHT:

1. The objects present in the dark room are not visible. But when the light is switched on, everything present in the room becomes visible.Why?

2. Identify the mistake in the statement and correct them.

   (a) The splitting of white light into its constituent colours is due to multiple reflections.

   (b) The beautiful pattern that we obtain in a kaleidoscope is because of dispersion.

3. Reflection from a smooth surface is called ―――――― (Regular, Irregular)

4. If the angle of incidence is 40^0, the angle of reflection is ―――――― (0^0, 40^0)

5. Match the following

a) Irregular reflection	____	Glass Slab
b) Multiple reflection	____	Optic fiber
c) Refraction	____	Periscope
d) Total Internal reflection	____	Wood

6. If Raman fixed the two mirrors at an angle of 60^0 to get as many number of images. Could you help to tell the exact number of images produced.

$$\text{Hint } n = \frac{360}{\text{angle}} - 1$$

SOUND:

1. When we touch the ringing bell we can feel the ______________________ (Vibrations, Air)

2. Sound cannot travel in _______________ (Vacuum, Water)

3. We can hear the sound waves of frequency between 20 Hz to 20,000 Hz. This range is known as _______________ sound. (audible, inaudible)

4. Correct the wrong statement:
   Unwanted noise from any loudspeaker that causes discomfort of any kind is called Music.

5. Your parents are going to buy a home. They have been offered one on the roadside and another two lanes away from the roadside. Which house would you suggest to your parents considering the peaceful life?

6. Extremely loud sound can make one deaf could you tell the reason? Mention some steps should be taken to minimize noise pollution.

7. Factories should not be constructed in the residential areas. Do you agree or not? Give reason.

8. Veena and Rani are on the moon. Veena calls out to her friend. But Rani does not hear Veena's call eventhough she is near. Why?

FURTHER REFERENCE

Books

1. Fundamentals of Physics - David Halliday, Robert Resnick, Jeart Walker, John wiley. (Sixth edition)
2. A Second course in elementary physics - C.S. Karve and G.Z. Shah.

Website

www.glenbrook.k12.i.us/gbssci/phy/sound/.com

www.glenbrook.k12.i.us/gbssci/phy/optics/planemirror.com

www.arvindguptatoys.com

PHYSICS